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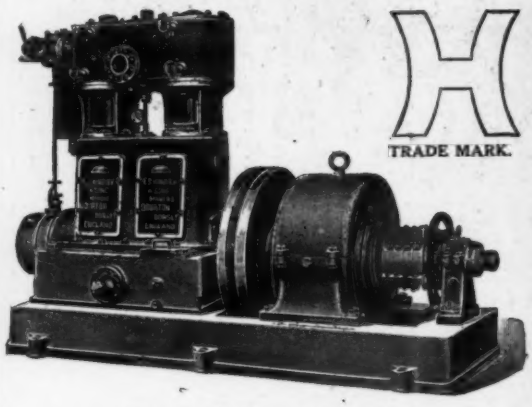

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ELECTRICAL REVIEW.

VOL. LXXXVII. DECEMBER 10, 1920. No. 2,246.

ELECTRICAL REVIEW.

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PRIVATE AND PUBLIC ECONOMY.

On the last day of November the Prime Minister dined with the Federation of British Industries. The members of that important body appear to have expected that, after refreshment, he would give them an explanation as to why our current year's expenditure is about twelve hundred million pounds, coupled with suitable regrets, and excuses; and that he would inform them by how many millions this colossal total was to be reduced next year.

They were, however, treated to a cheery and amusing speech, punctuated by laughter and cheers, full of sallies against Government critics, but without one word of justification for the present disastrous policy, or hope of amendment for the future. Although the members of the Federation had dined, they were sent empty away.

To their astonishment they were even lectured on the need for economy, all round, public and private, just as though they themselves were responsible for public finance and the Government were paying the taxes.

They were informed that the Government must feel that it had the nation behind it in the matter of economy. They were informed that they seemed to have forgotten that there had been a war, and, as a final touch of that sublime audacity for which Mr. Lloyd George is so justly famous, he suggested that in each household in the country a committee should be formed to cut down the domestic expenditure.

The Premier seems to be quite unconscious of the fact that in most households—outside Government circles—the struggle for existence has become too keen to permit of any time for committee meetings, or much conversation of any kind; and that the possibility of carrying on at all, even if employment continues, is much more likely to be the topic, rather than any question of further possible deprivations.

Sir Robert Horne, who followed, addressed himself to some of the actual conditions which have to be met; and he pointed out that the increasing importation of competing goods was largely due to the state of the exchange, and to the fact that our own production costs were too high for the world's markets.

The cry to produce more should be put in another way: Produce more economically.

The Premier's speech at the Federation of British Industries has not enjoyed a good Press, and newspapers of almost all shades of opinion continue the campaign for economy. At the Business Conference called by the Federation, resolutions were passed requesting the repeal of the excess profits duty and the corporation tax, stating that the taxable capacity of the country had already been exceeded, condemning any direct taxation of production, and demanding drastic economies on the part of the Government. In the meantime the Government has set up one committee for effecting economies, and another to consider the question of higher salaries for Ministers and M.P.s. Possibly if M.P.s were obliged to "clock in and out," and were paid by the hour, we should not read so often of critical divisions in which 150 or so members took part out of a possible total of 707.

Mr. Peter Rylands, who was re-elected President of the Federation of British Industries, pointed out the enormous accruing liability on account of the excess profits duty, and the danger of the moment arriving when the liability would be beyond the capacity of industry. He remarked also on the less favourable disposition of the working classes to bear privations, and spoke of the illusions caused by the apparent plenty during the war. He said that anyone who lived on his capital (as we did during the war) could have a right royal time, but was afterwards sure of repentance and headache.

The Executive Council of the Association of British Chambers of Commerce has just sent in to the Chancellor of the Exchequer its advice for the next Budget. It roundly condemns the excess profits duty, alleges waste and extravagance in the Government departments, and calls for a budget expenditure not to exceed £910,000,000, which is approximately the figure once fixed by the Chancellor himself for a normal year. Whether this or some other figure be the proper limit, it seems to be clear that unless Parliament sets a total, and refuses to exceed it, the torrent of waste will not diminish.

But we think a clear line should be drawn between productive and unproductive expenditure, and this is a distinction which seems lately to have escaped attention. For instance, take housing. If the Government itself were spending directly, say, two million pounds on housing, it might be said roughly that the rents or repayments would justify about half the cost, and therefore one million would be productive and one million unproductive expenditure. Again, the vast sums that we spent on the Ministry of Reconstruction must be regarded as utterly lost. We believe that even the pamphlets were not all distributed. Money spent upon the proposed Severn tidal power scheme, however, should be reproductive—it cannot otherwise be justified—and the reformers, if they are true economists, will aim at lopping off a few Ministries, rather than at stopping a great enterprise designed to increase the output of the country and reduce first cost, which is an essential condition to selling our goods and regaining our foreign markets.

We would venture to advise the Federation of British Industries and the Chambers of Commerce to set up an Economy Committee of their own—not in some humble cottage, but in the neighbourhood of the Palace of Westminster, with a well-paid expert accountant to devote his whole time to the business—and let that committee examine and criticise publicly every item of Government expenditure, and tabulate every instance of scandalous waste and peculation that comes to light, together with all the names of parties concerned; and thus take care that if the nation chooses to continue the present system of government it shall at least do so with a full knowledge of the facts.

Since Parliament, paid to control, fails in its duty, it becomes necessary for the people who are eventually responsible for national industrial prosperity to take it in hand themselves and see that the information collected is in handy form, and ready for use at the next General Election, by any party, of whatever colour, that wishes to prevent the ultimate ruin of the Empire.

The I.E.E. Subscriptions.

The Council of the Institution of Electrical Engineers is to be congratulated on the result of the special meeting held last week to consider the proposed increase of subscriptions; the sense of the meeting was manifestly in favour of the new rates, unwelcome as might be the necessity of an increase, and the majority was overwhelming when the question was put to the vote. Mr. Purse, feeling bound in duty to the members whose proxies he held to press their opposition to the limit, was nevertheless well advised in consenting to withdraw his demand for a poll; as the President showed, the majority of proxies against him was no less crushing than that of the members present, and to have prolonged the meeting for the sake of a useless formality would have been highly injudicious, to say the least. We can hardly believe, in any event, that Mr. Purse's supporters would feel particularly well disposed towards his alternative proposal—to add 10s. 6d. to the subscriptions in all grades—as that obviously places the bulk of the burden on the shoulders of the junior ranks, representing an increase of 30 to 50 per cent. in the case of Students, 16-20 per cent. for Associates and Associate Members, and 12-14 per cent. for Members. What a storm there would have been if the Council, in a moment of mental aberration, had proposed such a scheme! We think it probable that Mr. Purse will gain even less support at the confirmatory meeting than he did last week.

A suggestion that members who have compounded for their subscriptions should now be called upon to contribute further to the funds appears to us to be incompatible with the principles on which such arrangements are based; it would be as reasonable for an insurance company from which a man had purchased a life annuity to call upon him to pay further sums on the ground that the company's expenses had increased. Is there to be no sanctity in a contract? The Articles explicitly state that such members shall not be required to pay a further amount.

We cannot refrain from expressing admiration at the masterly manner in which the President placed the Council's case before the meeting, as well as the tact and ability with which he guided the proceedings.

Mr. J. E. Kingsbury, in a brief but impressive speech, placed the discussion on a high plane, emphasising the fact that members should not merely ask what they were to get out of the Institution, but should consider what they could give to it, in order to further the interests of the profession and industry. Mr. Adams also made a useful contribution to the debate.

It is interesting to note that whilst this was, we believe, the second occasion on which proxy papers were issued, they have not yet been used for the purpose of a poll. The only effective proxy at the meeting was, in fact, that exercised by Sir James Devonshire when, in the course of a cogent argument in support of the Council's scheme, he quoted with emphatic approval our recent summary of the situation.

The Crisis.

Elsewhere we report the progress that has been made towards the settlement of the E.P.E.A. dispute. Up to the meeting of the National Joint Board last Saturday 101 undertakings had adopted the schedule; 20 had accepted it with reservations; 28 had refused; and 90 had not replied to Ald. Walker's circular letter. In numbers, therefore, the ayes and the noes are about equal, but in magnitude, it is stated, the 101 concerns represent 70 per cent. of the whole. On this result the Joint Board and the Association are to be congratulated.

With regard to the non-contents, many of these are small companies which, while professing willingness to concede the terms, plead inability to pay them, at any rate until they are authorised to charge higher prices for electricity. On the other hand, they certainly will not obtain that authority unless they adopt the schedule, for the Joint Board is fully recognised by the Government, and thus a "vicious circle" is set up. We cannot but sympathise with these companies, which have not the rates to draw upon if they make a deficit, and we should think that a compromise could be attained without much difficulty; provided that they agreed to pay the new rates directly they were authorised to raise their prices, we should think they might be counted with the undertakings which have adopted the schedule. We are pleased to see that the Association has agreed to postpone the notices in the case of all authorities which adopt the schedule, as we suggested in our last issue; we cordially hope that conciliatory methods will prevail, and that some means may be found, acceptable to both sides, which will obviate recourse to the strike weapon, due to come into operation next Tuesday.

THE JURISDICTION OF THE ELECTRICITY COMMISSIONERS.

By A LEGAL CONTRIBUTOR.

On September 24th the report of the Electricity Commissioners upon the applications of the Nottingham Corporation and the Derbyshire and Nottinghamshire Electric Power Co. for leave to build generating stations was published in the Electrical Review. A public inquiry was held by the Commissioners in July last, and this report represents their findings. As this was the first inquiry held in the exercise of a jurisdiction conferred by the Electricity (Supply) Act, 1919,* the proceedings before the Commissioners and their report are of considerable interest. Those who supply electricity are concerned to know by what authority the Commissioners act, the nature and extent of their powers, and the circumstances in which those powers are and will be exercised.

The Act of 1919 makes no stipulations as to how these inquiries are to be held; but it is apparent from a perusal of a transcript of the shorthand notes that they are conducted very much on the lines of an ordinary arbitration. If one may be permitted to say so, nothing could exceed the courtesy and consideration shown by the chairman and his colleagues to all parties concerned.

It is necessary in the first place to understand the jurisdiction and powers of the Commissioners. By Section 11 of the Act of 1919, notwithstanding the provisions of any special Act, "It shall not be lawful for any authority, company, or person to establish a new or extend an existing generating station . . . without the consent of the Electricity Commissioners (which consent shall not be refused or made subject to compliance with conditions to which the authority, company, or person object, unless a local inquiry has been held) . . ." Then follow certain exceptions which are not material for the present purpose. It is well to note, at the outset, that the Act thus empowers the Commissioners to cut down the statutory rights and privileges of an existing authority or company, who could formerly build generating stations in accordance with their powers, as and when they pleased. By Section 33 the Commissioners may hold inquiries, while by Section 34 they and the Board of Trade (now the Ministry of Transport) may make rules of procedure. There is no appeal from any ruling or decision of the Commissioners, but it would seem that there is no penalty attaching to anyone who thinks proper to build a station without the necessary permission.

To come now to the history of the applications above mentioned. In 1901 the Derbyshire and Nottinghamshire Electric Power Co. (which may be referred to for the sake of brevity as the power company) were empowered by statute to supply electricity in bulk to the whole county of Nottingham and part of the county of Derby. They could supply to the various boroughs in the area, but subject in the case of each borough including Nottingham, to the consent in writing of the Corporation. The same Act enabled the power company to erect stations at Colwick (near the Trent), and at Ilkeston. They did in fact erect a station at Ilkeston, where, at the date of the inquiry, they had an installation representing 5,000 kw. (a.c.) and 4,000 kw. (d.c.). In 1912 they sold 1,839,899 units, and for the current year it was estimated that the demand would be 10,000,000. To meet this, and with a view to further extensions, they desired to erect a new station at Colwick, where, having regard to the proximity of condensing water and other advantages, it was conceived that they would be able to build a station large enough to meet all present and further demands. They took a lease of the site on March 25th, 1919, for 99 years, with power to purchase the freehold. The rent for the first year was £138 14s., rising to £554 16s.

In these circumstances they applied to the Commissioners for the necessary consent. On June 23rd, 1920, the secretary to the Commissioners wrote to point out the nature of the evidence which the Commissioners would require in support of the application. In particular, evidence was required of present loan, probable future demands, technical proposals for the new station, and an estimate of future financial results. The power company were also asked to state their "proposals in the event of the establishment of a joint electricity authority for the district."

The Borough of Nottingham never took any electricity from the power company. They had power to supply within their own district under a provisional order which they obtained in 1890.

They were the principal opponents of the power company's application. They were themselves seeking the permission of the Commissioners to erect a generating station on what was called the Clifton site.

It was stated by the town clerk, when opening the case for the Corporation, that in 1914 they had come to the conclusion that a new station was necessary. Having received a report from Sir Alexander Kennedy, they chose a site on the river Trent, but nothing was done immediately owing to the war. After the armistice, however, the Electricity Committee, having come to the conclusion that it would be no longer possible to consider municipal boundaries in the matter of electricity supply, summoned a conference of local authorities, *e.g.*, those of Leicester, Derby, Nottingham, Mansfield, Loughborough, Newark, and Long Eaton. This conference employed two engineers who propounded a scheme which should deal not only with Nottingham, but with the whole area represented by the conference. Subsequently Mr. J. H. Rider was employed to report on the position of Nottingham itself. He recommended, *inter alia*, the erection of a station on the Trent near the Clifton Colliery, which would fit in the larger scheme if and when a joint electricity authority was set up. It was for power to erect this station at a cost of about £800,000 that the Corporation made the application to the Commissioners. Towards the end of his address the town clerk said: "The Corporation quite realise that it is the intention of the Government and the Commissioners to divide the country into districts, and to set up joint authorities where they can properly be established. Their proposals with regard to this station are made so that when any scheme is brought forward or put into operation this station will fit the requirements of the scheme."

The power company opposed the application of the Corporation on the ground that a power station of such size was wholly unnecessary for supply in Nottingham; that, in effect, the Corporation could make no profitable use of it without power to supply outside the borough, which could not be obtained except by Act of Parliament. Certain coal owners also objected to the application, because if the station to be built by the Corporation were erected and were to become the property of a joint authority, they would inevitably be left out.

The case of the power company was first heard. The opposition of the Corporation was based chiefly on the allegation that inasmuch as the power company had done so little in the past, they did not deserve to be further encouraged. Objection was also taken to the proposed site on the ground that it was less convenient and less near the "centre of gravity" of the district than the site of 80 acres which the Corporation desired to utilise.

In the course of the inquiry, the chairman pointed out that they could not neglect the probability of a joint

* Since this article was written the Commissioners have held an inquiry upon an application of the County of London Co. for leave to erect a station at Barking. This matter being still *sub judice* is not here referred to.

electricity authority being set up. He intimated that if they were to give their consent to the construction of one or other of the proposed stations they would be obliged to impose a condition which would safeguard such a joint authority, *e.g.*, a condition which would enable them to repay the capital expended by the company *plus* a reasonable rate of interest defined by the Act. He said that such a condition had been imposed by Parliament in the case of the Shropshire, Worcestershire, and Staffordshire Electric Power Co. (by Section 19 of their Act). He also intimated that the Commissioners proposed very shortly to determine provisionally the limits of the electricity district, which would certainly contain the city of Nottingham, and probably the whole or a very large part of the area of the power company.* The power company were not willing to accept this condition, but the Corporation were quite ready to comply with it.

As has already been pointed out, no secret was made of the fact that the Corporation were asking for leave to erect a station much larger than was necessary to meet their immediate needs. Thus it was pointed out by one of their witnesses that taking into account the present and immediate future demand upon the Corporation, the most they required was to generate 16,000 KW.

We now come to the report of the Commissioners.† They refused the application of the power company on the ground that it would be an encroachment on the Corporation's rights of supply. They granted that of the Corporation—giving them leave to erect the proposed generating station on the site proposed, on the terms: (1) Plan and lay-out to be approved by the Commissioners; (2) the Corporation must if required supply to the power company such high-pressure current as the company may require, on terms to be agreed, or if not agreed, upon terms to be settled by the Commissioners; (3) if an authority is set up for the district under the Electricity (Supply) Act of last year, the Corporation shall if required by the authority, and if directed by the Commissioners, transfer the station to the joint authority, the Corporation being reimbursed on certain terms.

It is unnecessary to go at length into the reasons why the Commissioners refused the application of the power company. They were largely of a technical character; but it is interesting to consider the legal effect of the conditions on which the Corporation are to be allowed to build their generating station.

The first requirement does not invite comment. The second, however, is more interesting. It is founded, presumably, upon Sec. 19 of the Act by which "during the period between the passing of this Act and the establishment of a Joint Electricity Authority" any two or more authorised distributors may with the approval of the Commissioners, and if so required by the Electricity Commissioners shall, enter into arrangements for "(*a*) the giving and taking of a supply of electricity and the distribution and supply of the electricity so taken." The arrangement is to be made on such terms and conditions as may be agreed, or, if the arrangement is made in pursuance of a requirement by the Electricity Commissioners, on such terms and conditions as in default of agreement may be settled by the Commissioners.

It is plain from the wording of the section that (*a*) no arrangement between authorised undertakers for a supply, and (*b*) no order for the giving of a supply, can be made by the Commissioners, except within the transitory period. If nothing is settled before the Joint Authority comes into being, the authorised distributors are powerless to agree, and the Commissioners cannot compel them to enter into an agreement.

As the matter has probably been settled in the Nottingham district since the Commissioners published their report, the question, in one aspect, may be only of mere academic interest. But there is another aspect of the matter which is not quite so clear. Can an agreement be made, or can the Commissioners make an order, which shall continue to be effective after the formation of the Joint Authority? This is a question which is at least open to argument.

It is to be observed that Sec. 19 forms one of a group of sections to which the heading "Transitory Provisions" is prefixed in the Act. A cross heading governs each of the sections which is ranged under it (*Eastern Counties and London and Blackwall Railway Co. v. Marriage*, 9 H.L. Cas. 32). It follows that the provisions of Sec. 19 are to be regarded as transitory only. Now it is obvious that in so far as it confers power on the Commissioners to direct that authorised undertakers shall give or take a supply of electricity upon terms to be settled by them, Sec. 19 confers upon them power to interfere with existing rights, and an enactment which interferes with existing rights must be strictly construed (*Stead v. Carey*, 1 C.B. 496). Bearing these principles in mind, it is difficult to see how terms can be imposed upon authorised distributors which shall remain in force after the formation of the Joint Authority. Take an extreme case. Suppose it was ordered that authority A should supply, and authority B should take, x units per annum at 1d. per unit *for all time* after the date of the order. This would constitute an interference with existing statutory rights, and would be the result of the exercise of a power conferred by an Act of Parliament which is declared to be transitory in its effect. It may be argued that other provisions of Sec. 19, empowering the Commissioners to authorise the breaking up of roads, &c., which may be necessary for carrying the "arrangement" into effect, and authorising local authorities to borrow for a similar purpose, tend to show that the provision was intended to be anything but transitory. At the same time it is difficult to ignore the first few words of the section which appear to govern the whole.

Those who drafted the Act may have been of opinion that they were conferring powers which should have permanent effect. That this is so is to some extent confirmed by the fact that the Electricity (Supply) Bill, 1920, now before Parliament makes no reference to the matter.

The Commissioners apparently had power to impose this condition in so far as it is *permissive* by virtue of Sec. 4 (3) of the Electric Lighting Act, 1909, by which "the Board of Trade may, if they think fit, by order, permit any undertakers to supply electricity in bulk to any other undertakers upon such terms and subject to such conditions as may be specified in the order." By Sec. 2 of the Act of 1919 the Ministry of Transport appear to be able to exercise this power through the Electricity Commissioners. But it is obvious that Sec. 4 (3) of the Act of 1909 was enabling only. It did not confer power upon the Board of Trade to compel any authority to give or take a supply at any particular price, or at all.

The fact that the Commissioners thought it right to impose the third condition makes it plain that they are confident that a Joint Authority for the Nottingham district will presently come into being. This is a matter upon which they must have means of knowledge not accessible to the outside public. But it is interesting to speculate, from a purely legal point of view, upon the effect of this condition. It may be, of course, that the power company are ready and willing to assist in the formation of a joint authority; but it is manifest that no obligation is imposed upon the Corporation unless and until the joint authority is formed.

It seems that the owners of any undertaking may seriously hamper the work of a Joint Authority, for by Section 6 of the Act of 1919 (which makes provision for the establishment of a Joint Authority) it is expressly provided that "no such scheme shall provide for the transfer to the authority of any part of an undertaking except with the consent of the owners thereof." It is clear from this that the existing generating station and mains of the power company could not be transferred to the Joint Authority except with the consent of the power company.

* The East Midlands District has since been provisionally determined (Elec. Rev., Nov. 5th, 1920, p. 591).—Eds.

† See the Electrical Review, Sept. 24th, 1920, p. 401.

Again, the fact that a joint authority may supply electricity does not prevent existing undertakers from continuing to supply in their own areas, in accordance with their powers—it may be in direct competition with the Joint Authority—unless, indeed, the Commissioners exercise the peculiar power conferred upon them by Section 14 (1) of the Act.

By this section the Commissioners may by order "exclude from the area of supply of any power company any part of that area which at the time of application is not being supplied by the company, and which it appears to the Electricity Commissioners *could be better served by the Joint Electricity Authority*." The words in italics are important, because although the Commissioners may be of opinion that the Joint Authority could better serve the district, they have no power to authorise them to do so. If the power company object to being deprived of part of their statutory area, no effect can be given to the proposal of the Commissioners so depriving them without a special order, that is to say, an order made after a public inquiry, and confirmed by the Ministry of Transport, which cannot come into force until it has lain on the tables of both Houses of Parliament for 30 days.

But even if such a special order were made, the result might be to wholly deprive the excluded area of any supply of electricity.

Another provision of the Act is very important in this connection. By Section 12 (1) a joint authority may supply electricity within their district subject to certain limitations, "that is to say, the authority shall not supply electricity . . . (*b*) in any part of the area of supply of a power company for any purpose for which the company are therein authorised to supply electricity without the consent of the company, except to the previous owner of a generating station which has been transferred to the joint electricity authority or," &c.

Applying this provision to the Nottingham case, it means that if the Joint Authority for the district acquire the proposed generating station from the Nottingham Corporation, they may supply electricity to the Corporation without the consent of the power company. To grant a supply elsewhere in the power company's area they must obtain the company's consent. The Ministry of Transport may, however, dispense with this consent if it is unreasonably withheld. This consent is to be deemed to be unreasonably refused or withheld if the power company "are not willing and in a position to give the requisite supply upon reasonable terms within a reasonable time." Suppose—to take this very case—a Joint Authority were established for the Nottingham district. Suppose the present power company refused their consent above referred to, and the Ministry of Transport seek to dispense with that consent on the ground that the power company not being able to supply, their consent must be deemed to have been unreasonably withheld. One answer might be: "We applied for leave to build a generating station, and it was refused by the Commissioners!"

It may be said that the above observations upon the third condition imposed by the Commissioners are of a technical character. They may nevertheless become important. The Act of 1919 provides that "it shall be the duty of every joint electricity authority constituted under this Act, to provide or secure the provision of a cheap and abundant supply of electricity within their district." If, when the time comes for the performance of this duty, there is found already in the field a power company who, whether rightly or wrongly, consider that they have been deprived of rights solemnly conferred by the legislature, technical points may become formidable obstacles to the joint authority.

All these considerations were doubtless duly weighed by the Commissioners when deciding to grant the application of the Corporation. In the matter of imposing conditions, they have an absolutely free hand. They are not a legal tribunal in the ordinary sense. To use the words of Section 1 (4) of the Act, to which they owe their being: "Three of the Commissioners shall be selected for practical, commercial, and scientific knowledge and wide business experience, including that of electrical supply." Had they when holding this inquiry been a court of law construing—and bound to construe—an Act of Parliament according to well-known canons of construction, a somewhat interesting argument might have been addressed to them. For example, if the material section—Section 11—of the Act of 1919 is looked at by itself, its intent and meaning appears to be that applications for leave to erect generating stations should only be made by those who find it necessary to extend or build for the purposes of supply in their own area. Here it was made perfectly plain by the Nottingham Corporation at a very early stage that they wanted this new generating station for a much larger purpose. On such a reading of the Act it would have been perfectly competent for the Commissioners to rule out their application on this very simple ground.

But the explanation probably is that the Nottingham Corporation already have statutory power to supply in bulk outside their district, and the Commissioners were satisfied that, wholly apart from the possible demand of the power company, there was good ground to suppose that the Corporation would be able to dispose of the whole output from the proposed generating station.

An interesting question here obtrudes itself. Have the Commissioners any power to authorise undertakers to supply outside their district?

Let us look in the first place at the older Acts. Supply of energy outside the area is prohibited by Section 4 (2) of the Schedule to the Electric Lighting (Clauses) Act, 1899. Unless power to supply in bulk outside the area has been granted by special Act, it can only be obtained by an order made upon an application pursuant to Section 4 (3) of the Electric Lighting Act, 1909, which has been already referred to. But no order can be made under that section unless the supply can be given without breaking up any streets except such as the undertakers giving or the undertakers receiving the supply are authorised to break up, and unless parties objecting have an opportunity of being heard. It is important to notice that this section makes no provision for further borrowing powers by a local authority. A power company which might be ready and willing to give the supply forming the subject matter of the agreement, would obviously be a party entitled to be heard.

With regard to supply other than bulk supply outside an area, this could only be given pursuant to Section 6 (1) of the Act of 1909, whereby *the occupier of any premises* desiring to be supplied by undertakers in another district may apply to the Board of Trade for the necessary order. The order may be made if the undertakers in the area of the applicant consent, but that consent must not be unreasonably withheld. This jurisdiction of the Board of Trade is now exercised by the Commissioners; it is pointed out in a well-known work on the Electric Lighting Acts that "an order will only be made in respect of specific premises, and not in respect of an addition to the area of supply of the undertakers."

These were the only statutory provisions of general application for supply outside the area prior to the Act of 1919. It remains to consider the effect of that Act. It certainly does not, in terms, authorise the Commissioners, or anyone else, to permit supply outside an area. The only section of the Act which bears upon the subject is Section 19, which has been considered in an earlier part of this article. It is clear that this section impliedly permits any authorised undertakers "within the locality" of a Joint Electricity Authority to supply outside their area. Such a supply would necessarily be involved in an "arrangement" made under that section. But if an order were made pursuant to this section authorising supply in bulk, it is submitted that the right of parties interested to be heard and to state objections already conferred by Section 4 (3) of the Act of 1909 (which is not repealed), could still be exercised.

Again, supposing it were made part of "an arrangement" ordered by the Commissioners pursuant to Section 19 of the Act of 1919 affecting two areas A and B, that certain consumers in the district A should thenceforth be supplied by the undertakers in area B. It would certainly be open to the undertakers in area A to argue that, by virtue of the provisions of Section 6 (1) of the Act of 1909 (which, again, is not repealed), they were entitled to withhold their consent to the transfer.

It would not be right to assume that the Electricity Commissioners may not, for some purposes, be considered to be acting in a judicial capacity when holding inquiries. Thus assuming they refused to hold an inquiry when called upon to do so, it is probable that a writ of mandamus would be issued to compel them. (See *e.g.* Rhymney Iron Co., Ltd. *v.* Rhymney Rail Co., 6 Ry. & Can. Tr. Cas. 60.)

There is one other matter in relation to this inquiry which is of interest. According to the rules, persons interested are entitled to appear and be heard. An application was made by the town clerk of Derby to appear and be heard as representing the Conference of the Municipal Electricity Undertakings. It was pointed out that these bodies were concerned with the scheme for the East Midlands, and that they had had nothing to do with the application on behalf of Nottingham. On this ground counsel for the power company objected to their being heard; he contended that they had no *locus standi*. Eventually the right of audience was granted, and a witness was called on the part of the conference.

It is presumed that in thus extending the right of audience, the Commissioners were acting on the analogy of the Parliamentary Standing Order 133a, by which any society or association sufficiently representing a trade, business, or interest in the district to which the Bill relates, and alleging that such trade, business, or interest will be injuriously affected by the provisions of such Bill may appear and be heard in opposition to it.

NEW ELECTRICAL PROPOSALS FOR PARLIAMENT TO CONSIDER.

We give below a list of the proposals that will come forward in the next session of Parliament. Readers who are desirous of obtaining further information will find the applications published in the *London Gazette* for November 16th, 19th, 23rd and 26th.

(a) Electric Light and Power.

Batley Corporation.—Further powers as regards the electric light undertaking, provision of show rooms, increase of charges for electricity, &c.

Bexhill Corporation.—Further electricity powers, &c.

County of London Electric Supply Co.—Powers to acquire land, &c., in the parish of Barking and to erect generating station thereon and to distribute electrical energy, constitution of separate undertaking and provisions relative thereto, repeal or amendment of provisions as to purchase of portion of company's undertaking, certain financial provisions, &c.

Falmouth Dock Co.—Powers to repair, build, and salve, &c., vessels, to carry on an engineering business and provisions with reference thereto.

Leyton U.D.C.—Further powers with regard to the electricity undertaking.

London County Council.—Further provisions as to control of premises where celluloid is kept, &c.

Manchester Corporation.—General powers, including certain financial provisions.

Rotherham Corporation.—Further powers with regard to the electricity undertaking, additional provisions as to running motor-omnibuses, &c., further powers with reference to the tramway undertaking, trolley vehicles and omnibuses, construction of new tramways, &c.

Waltham and Cheshunt Gas and Coke Co.—Powers to apply for a provisional order to supply electricity.

(b) Electric Tramway, Motor-'bus and Railless Trolley Vehicles.

Burnley Corporation.—Provision and running of motor-omnibuses within and beyond the borough, financial provisions, including the suspension of any payment to any sinking fund, for such period as may be specified in the Bill. Repeal and amendment of certain Acts and Orders.

Chatham and District Light Railways Co.—Certain financial provisions.

City of Oxford Electric Tramways Co.—Powers to increase fares and charges in respect of the motor-omnibuses.

Colne Corporation.—Powers to run omnibuses within and without the borough, to increase maximum charges for electricity, and further powers as regards the electricity undertaking.

Durham County Council.—Construction and working of tramways, trolley vehicles in the administrative County of Durham and the county boroughs of Gateshead and Sunderland, powers to provide and run motor-omnibuses, incidental powers with regard to tramways, trolley vehicles and motor omnibuses.

Gosforth U.D.C.—Powers to run motor-omnibuses within and without the borough.

Grimsby Corporation.—Construction and reconstruction of tramways, provision of trailer cars, powers to run motor-omnibuses and trolley vehicles, further powers with regard to the electricity undertaking, and to increase the maximum prices for the supply of electricity; provision of showrooms, &c.

Hastings Tramways Co.—Extension of tramways, &c., to Fish Market, Hastings.

Hoylake and West Kirby U.D.C.—Provision and running of motor-omnibuses within and beyond the district.

Leicester Corporation.—Construction of new tramways, provision and use of trailer cars, further powers as regards tramways and omnibuses.

Liverpool Corporation.—Continuance and maintenance of the tramway undertaking, including the tramway and omnibus undertaking carried on by the former Liverpool United Tramway and Omnibus Co., construction of new tramways, further provisions as regards the electricity undertaking.

Nelson Corporation.—Provision and running of motor-omnibuses within and beyond the borough, further powers with regard to the electricity undertaking.

Nuneaton Corporation.—Powers to run motor-omnibuses within and beyond the borough, confirmation of agreement with the Birmingham and Midland Omnibus Co., Ltd.

St. Helens Corporation.—Power to run motor-omnibuses within and without the borough, increase of tramway fares, further provisions as to the tramway undertaking, powers to apply for provisional orders authorising trolley vehicles, and to increase charges for the supply of electricity.

South Shields Corporation.—Extension of the borough to include the parish of Horton and parts of the parishes of Whitburn, Bolden, and Monkton, revival of powers and extension of time for completion of authorised tramways, provision and running of motor-omnibuses within and without the borough, extension of area for supply of electricity, and further powers with regard to the electricity undertaking.

Wigan Corporation.—Construction of tramways, increase of tramway fares and charges, provisions as to trolley vehicles, powers to run motor-omnibuses within and without the borough, further electricity powers, including the provision of showrooms, &c.

(c) Railways.

Thames Deep-water Wharf and Railways.—New company; powers to construct wharf, railway and electric generating stations, working of railway by steam or electricity, and to supply electrical energy, arrangements with the Midland and G.E.R., powers to run omnibuses, motor coaches, &c.

London and North-Western Railway Co.—Extending the periods limited by the Wolverhampton and Cannock Light Railway Order, authorising the abandonment of certain of such railways, and giving powers for the construction of deviation railways in substitution therefor and a branch railway in addition thereto.

E.P.E.A. Dinner. — The South Coast Section of the Electrical Power Engineers' Association held their second annual meeting and dinner at Brighton, on November 27th, and in view of the situation created by the demand of those employed in the technical branch of the undertaking, the occasion was of special significance. At the dinner, which was attended by about 50, including the wives of members of the Association, the chair was occupied by Mr. J. H. Parker (Croydon), president of the Association, who was supported by Mr. J. Thomas (assistant general secretary), Mr. J. Christie (electrical engineer and manager of the Brighton electricity works), and Mr. C. B. Smith (chief engineer, Hove electricity works). The president presented Mr. Gibbons with a cheque in recognition of the valuable service he has rendered as hon. secretary of the South Coast Section. Mr. Whiting received a case of pipes for his services as hon. treasurer. The dinner was followed by a concert.—*Sussex Daily News.*

MESSRS. POPE'S LAMP WORKS.

By the invitation of the directors of Messrs. Pope's Electric Lamp Co., Ltd., a very pleasant and instructive morning was spent on Monday last at the "Elasta" electric lamp works, Willesden. Accuracy and uniformity are vital qualities in the production of electric lamps, and a visit to the above works, which were inaugurated in 1904 by Mr. F. R. Pope, one of the pioneers in the electric lamp industry, suffices to provide irrefutable evidence of the care taken to ensure perfection in the manufacture of British lamps.

To the uninitiated, the large amount of work that is put into, and the number of processes that go to the making of, an electric lamp come as a revelation. Much of the work is necessarily of a very delicate character, and requires to be carried out with skill and precision. It is an industry in which the employment of girls and women appears to be eminently suitable, and the results obtained by the firm testify to the efficient manner in which they carry out their work. The total staff employed numbers over 700, of which

Fig. 1.—Vacuum Lamp Exhausting Department.

figure some 680 employés are girls. Many of the girls in their daily tasks of testing lamps and other similar operations are exposed for long periods day after day to the bright glare of unshaded lamps which, for certain purposes, are sometimes run at a pressure much in excess of their normal voltage. Nevertheless it is a remarkable fact that none complain of any ill effects to their eyes. They are, of course, all provided with protective glasses, but it is next to impossible to induce the girls to wear them, and some of the employés have been working for eight or nine years without any ill effects resulting therefrom.

"Elasta" drawn-wire lamps, both of the vacuum and gasfilled types, are made at the factory, in addition to "Pope" carbon-filament lamps, and some of the processes are common to all. Taking the vacuum lamp as representative, and noting differences of treatment as they occur, it may be explained that the molybdenum oxide, which in due course provides the supports for the filament, is first reduced to a grey powder by the application of a very high temperature in electric furnaces. A certain quantity is then placed in steel moulds, and under hydraulic pressure is transformed into square rods, which then go through the process of sintering, in a special department, in order to render them homogeneous and capable of being hammered and drawn. In the hammering machines the rods are reduced gradually, and can be gauged to any degree of fineness required. The drawn wire tungsten filaments are manufactured also in a similar way.

The first stage in the manufacture of the lamp proper begins with the simple glass tubing, which is cut by miniature circular saws into short lengths as a preliminary to forming the flanges; each piece is then heated and flanged by a single motion in a rotating machine, and becomes a part of the foot of the lamp. The copper and platinum leading-in wires are next prepared and fixed in the glass foot. With the wires affixed, it then passes to a room devoted to the examination and testing of this component part for continuity. "Foot-building" is the next process, and consists in making the studs, and inserting the top and bottom supports, ready for the mounting of the tungsten wire filament. Special machines, known as "formers," give the filament its correct shape for mounting on the supports, and to this delicate process of attaching the filament a spacious department is allotted.

The bulbs, which are obtained from the glass works of the company at Newcastle-on-Tyne, are washed and dried by special and speedy methods, and sent to the "stemmers," who skilfully affix to each bulb a hollow stem of glass by which at a later stage the air is exhausted. Trays of filaments (mounted as described) and bulbs, each containing a definite number, are then passed to the operatives known as "lamp makers." Here the mushroom neck of each bulb left by the glass blowers is cracked off, and the filament with its support is sealed in, the process being done with rapidity and precision on automatic machines, needing only supervision and feeding, with the finishing touches, by the practised girl workers who attend them.

The lamp, having been made as far as its essentials are concerned, now goes to the examination department, where it is scrutinised and tested for possible defects, and its general appearance also receives criticism. The next operation is the important one of exhaustion, fig. 1. The actual vacuum is produced in two stages; first, by "rough" pumping and, secondly, by mercury pumps which remove the rarefied air that still remains in the bulb. A special preparation is applied during the process of exhaustion to assist in setting free any foreign matter which may be in the lamp and which, if permitted to remain, would impair the perfection of the vacuum. A test for vacuum is imperative at this point, and is applied by means of an induction coil, the current from which when sent through the lamp produces easily recognisable signs if any trace of air is still left. A flashing test provides still further against imperfections, and then comes the delicate operation of sealing off, by which the stem is removed from the bulb, and its place of juncture is betrayed by the familiar "pip."

Here it may be mentioned that the "rough" pumping and air-compressing plant required for various purposes in conjunction with the lamp-making machinery is electrically driven, and installed on the ground floor, being self-contained, and needing little attention. The mercury pumps are situated on the same floor as the actual exhausting apparatus.

From the exhausting department the lamps are dispatched for a preliminary test as complete lamps—previous tests having been incidental to the various individual processes. Having passed this preliminary trial, the real test by which each lamp is graded takes place in the photometer department where it is compared with an ascertained standard lamp, photometrically measured, and checked; here the lamps fall into their proper category of voltage and wattage. The skill and sensitiveness of the operators in this department have much to do with the obtaining of accurate results, and the quality of the lamps depends on the girls being trained to the nicest degree of discrimination.

The finishing department is concerned with extraneous matters—the capping of the lamp is the first operation in this concluding process, and for this non-hygroscopic cement is used. The leads are then soldered, or sweated in; cleaning

Fig. 2.—Gasfilled Lamp-making Department.

and examination for possible breakages or other suddenly developed defects follow, and the last stage in actual manufacture is the test for equality on the inspection screen, where hundreds of lamps are running under their correct voltage, and being carefully scrutinised for uniformity.

A few moments under the fingers of a skilled girl worker suffices to etch the name of the firm and the usual details on the bulb, and the lamp is then ready for dispatch to the packing department, where it receives its protective coverings and awaits its journey to the customer.

The various processes in the manufacture of the "Elasta" gasfilled lamp, though following the same general lines, differ in some respects from those obtaining in the vacuum type, and one of the chief differences lies in the preparation of the filament, fig. 2. The tungsten wire, after being drawn, is removed from its spools and spiralised on a special machine of the company's own design; its spiral form, after leaving this machine, is barely perceptible to the unaided eye. The construction of the lamp then follows the same routine as that of the vacuum type, with the exception of a slight varia-

tion in the method of mounting the filament, until it reaches the exhausting department, where after being treated in a similar manner by the "rough" pump and mercury pump, and tested for perfection of vacuum, argon gas is introduced. The lamp, now actually "gasfilled" is sealed off in the ordinary way before leaving the pump, the remaining operations being a repetition of those already described in dealing with the vacuum type.

In the manufacture of the carbon-filament lamp the method of mounting the filaments is slightly different. The bulbs are treated in the same way as before, but a large section is laid out for the purpose of flashing the carbon filament. In the exhaustion of the carbon-filament lamp the process is varied slightly, and further vacuum tests are carried out before the final stage is reached. The lamps are photometered and graded according to power and performance as previously described.

The principal types of lamp in the output of the Pope works, in addition to the standard "Elasta" drawn-wire vacuum and gasfilled types may be summarised as traction, ship, railway, candle, &c., as well as the carbon-filament lamp. It may not be without interest to mention that the firm has its own mess rooms for the workers, and that a social club in connection with the works is a great success. In the repair shop attached to the factory every facility is provided for the quick repair of machinery, and the engineering staff is fully competent to construct many of the ingenious machines in use.

NOTTINGHAM'S EXTENDED SCHEME.

A Proposed Expenditure of £1,193,000.

Considerable extensions of the first section of the scheme for the new electricity generating works of the Nottingham Corporation are contemplated. The matter was originally dealt with at an inquiry held by the Electricity Commissioners in July, when the Derby and Notts. Electric Power Co. submitted an alternative project, which was objected to upon the score of its interference with municipal rights; decision was given in favour of the City authorities, who had proposed as a first instalment of the new works to erect a power station for which land has been acquired near Clifton Colliery—one of the largest mining undertakings immediately contiguous to the City boundary—and to expend upon the necessary works £868,600, for which the Commissioners granted sanction, according to plans prepared by Mr. J. H. Rider, who is acting as electrical engineering expert to the Corporation. An integral feature of the undertaking, in relation to which important questions as to district supplies have also arisen, is the contemplated closing of the existing generating stations of the Corporation in Talbot Street and St. Ann's Well Road, in central areas of the City, the former representing the locale of the City's first electrical engineering venture, with its archaic plant which has formed the subject of continuous criticism. But Mr. Rider has now prepared a report, which came up for consideration at a meeting of the Corporation on Monday, pointing out that only the Talbot Street station can be closed down if two 10,000 kw. sets only are erected as constituting the first portion of the scheme, and that the full advantage of the new power station cannot be realised until the old steam plant at St. Ann's Well Road is shut down also. The committee, therefore, proposes to include in the first section of the works the provision of a 20,000-kw. turbo-alternator, as well as the two 10,000-kw. machines already decided upon, pointing out that in all probability long before the first instalment of the new plant is ready for work it will be necessary to order the 20,000-kw. machine, and that it will therefore be much more economical to include it in the first portion of the work than to add it after the operations are in progress. The addition of the 20,000-kw. set will finish the first complete section of the new station, and it will obviate the necessity of having building and erection work going on in an engine room and boiler house under steam and at work. The additional amount now required for the turbo-alternator—supplementary to the £868,600 already sanctioned by the Electricity Commissioners—will be, including auxiliary plant, £324,400, as recommended by Mr. Rider, making a total estimated expenditure for the first section complete, of £1,193,000. The committee points out in its report that the result will be to give 40,000 kw. installed capacity at a cost of £28.875 per kw., as against 20,000 kw. installed capacity at a cost of about £37.50 per kw. Although it has not been able to obtain any statement of the requirements of the Derby and Notts. Power Co., a matter which engaged the attention of the Electricity Commissioners at the recent inquiry, the committee calls attention to the fact that something will have to be done, either by the Corporation or by the Joint authority, for the East Midland district at an early date to meet the demands of the district outside Nottingham. In these circumstances the committee is strongly of opinion that the advice of Mr. Rider should be followed, and has recommended the Council to authorise it to include the new plant in the scheme for the erection of the new station and to accept tenders for the same and proceed with the work in due course. This additional work will enable the committee either to give some outside supply (keeping St. Ann's Well Road station at work if necessary) or to utilise the whole of the plant for the needs of Nottingham.

It has been ascertained by the committee that, if the term for the repayment of the proposed loan is fixed at 20 years, the approximate annual charge for sinking funds and interest will be £32,039. The committee needs also more money for the extension of mains in different parts of the City, having expended the whole of the capital sum of £20,000 sanctioned by the Council last year for underground work. With the £20,000 already expended, the committee has been enabled to lay extra-high-pressure mains to several large manufacturing works in the City of sufficient size to work in with the additional supply from the new power station, and mains have also been provided for the first section of the Corporation's housing scheme. A sum of £30,000 is now required for a general extension of mains and for transformers and switchgear in connection with the high-pressure mains already laid. The committee proposes, therefore, to make application to the Commissioners for sanction for the further borrowing of £30,000.

LONDON ELECTRICITY SUPPLY.

The report of the Special Committee on London Electricity Supply, appointed by the London County Council, was published last week, as noted in our last issue, and discussed in a leading article. After summarising the provisions of the Electricity (Supply) Act, 1919, the report states that Mr. J. H. Rider, on behalf of the Council, is engaged with representatives of the supply authorities of Greater London in the preparation of proposals covering the technical side of the question. With regard to the administrative and financial arrangements involved in the constitution of a Joint Electricity Authority, the Committee considers it essential that the clauses in the supplementary Bill dealing with finance, shall become law before the time arrives for the submission of any schemes to the Electricity Commissioners, but in view of the urgency of the matter, has proceeded with the preparation of a scheme.

The provisional district outlined by the Commissioners has a total area of 1,660 sq. miles, a population of over 7,900,000, and a total assessable value of £68,663,477. The Committee anticipates very great difficulty in producing an agreed scheme for so vast an area, having regard to the varied interests concerned and the complex requirements of supply. In the report the general heads of the scheme recommended by the Committee are outlined; while it is hoped that a joint scheme will be arrived at, in the alternative the Council will itself submit a complete scheme to the Commissioners.

The general lines of the Council's scheme are practically identical with the provisions of the 1919 Act, and, therefore, need not be detailed here. It is held that the immediate acquisition of the whole of the generation and transmission side of electricity supply in the area would handicap the authority, involving a very large capital outlay, and militating against efficiency. On the other hand, difficulties would arise from postponing the purchase of companies' undertakings until the dates specified under the Electric Lighting Act of 1888. The Committee therefore proposes that the Authority shall gradually replace plant in suitable existing stations as it becomes worn out or obsolete, put down new plant in existing or new stations, and provide any necessary new transmission mains. The Authority will thus gradually become the owner of the working plant in the generating stations, and when this process is practically complete, the entire generation side of the industry should be acquired. For the buildings and sites and mains, the terms of purchase proposed are the original cost, less appropriate depreciation. This complete transfer of ownership should be effected simultaneously throughout the whole area. Any old plant still in working order should be purchased on the same terms as the other assets. To facilitate a settlement on these lines, it is suggested that an extension of time as regards the distribution side of the enterprise may be granted to existing company undertakers.

In order to avoid raising more funds than are absolutely necessary, it is proposed that the Joint Authority shall, as far as possible, discharge its capital liabilities arising out of the purchase of undertakings by payment in electricity stock, reserving the bulk of the new money for the provision of new stations, extension of existing stations, and the replacement of obsolete plant.

The report recommends that the Council approve the basis of a scheme for submission to the Electricity Commissioners, providing for the development and extension of existing stations, where this can be done economically; the elimination as far as possible of uneconomical stations and plant; the supplementing of the supply by the erection of a large station or stations equipped with the most modern and economical plant available. The Joint Electricity Authority is to consist of not more than 30 representatives of the various interests concerned, and to control the existing undertakings so as to give effect to the scheme. The charges made by the Authority are to be such as to render the undertaking self-supporting, and to ensure that any saving effected by bulk supply derived from the Authority shall be passed on to the consumer. During the transition period the supply undertakers will pay rent for plant installed at the cost of the Authority.

The report was considered by the Finance Committee (No 2), which points out that during the period before the new

works are fully utilised the revenue may be insufficient to meet the loan charges in full, and that a guarantee by the Council of the stock of the London Joint Authority might therefore involve payments by the Council during the earlier years of the Authority's operations; but it would be open to the Council to attach such conditions to any guarantee as might appear reasonable to safeguard its financial position. It is not absolutely certain that the undertaking will be self-supporting, and therefore there is an element of risk in the advance or guarantee of loans; but the risk would be small, and in any event the Council will be free when the time arrives to decide whether or not to come in as regards the rendering of financial assistance to the Authority.

The report was adopted by the Council.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

A Curious Phenomenon.

As one of the regular readers of your paper, I am wondering if any of them can explain the following (to my mind) unusual occurrence which has recently been brought under my notice.

In a room containing one magneto and two battery-ringing telephone instruments (the latter side by side, and the former some 15 ft. distance away from them) there are gas burners fitted with incandescent gas mantles. It has been noticed that when *any* of these telephone bells ring, during the time they are *actually ringing*, the pressure of gas is very much stronger than when the bells are silent. The pressure of gas, however, remains constant when the station in question rings another station on either of the instruments previously described. In fairness, it ought to be stated that one of the two battery-ringing telephone instruments is fitted with a special key which, when operated, connects the lines to earth. This earth is, I believe, provided by a wire attached to one of the gas pipes in question.

I have never come across a similar case before, and shall, therefore, be glad of any information which can be furnished upon the subject.

J. Knowles Hassall.

Ashby-de-la-Zouch.
December 4th, 1920.

The Position of the E.S.C.A.

Your correspondent "Sussex" does well to draw attention to the position of the clerical staff of the industry, and as one of the long-suffering scribes I can endorse his remarks from bitter experience.

In days not very long distant some were "enjoying" bonuses of varying degrees—generally infinitesimal—and whilst by sheer weight of force the employers had to meet the increased cost of living as it affected the outside staff, yet the worker of respectable appearance was deemed able to exist on thin air and a very nominal addition to his salary. Even to-day men are paid 55s. a week in some areas as a "living" wage. It is assumed that it is impossible for their employers adequately to describe a "dying" subsistence.

To return to our position of to-day, the National Joint Board and the various subsidiary committees dealing with the whole question of wages were set up, and we, as a body of workers, were invited to elect representatives to the different bodies. This accomplished, recommendations of the Joint Board were issued in May of this year. Whilst the recommendations were less in amount (considerably) than we desired, we were content to honour the recommendations so far as the employés' side of the contract was concerned. It is only necessary to add that we, having submitted our case to a Joint Board, waited with unfailing patience, and giving the best of our services (as though we were being adequately remunerated and never knew the meaning of the word "want"), whilst the negotiations were in progress, at the end of another six months we are still waiting for the Joint Board to insist that its recommendations be carried out from the employers' side of the contract.

Can any of your readers imagine the howl of execration which would have rent the heavens had the employés thrown over these recommendations, and caused the maximum amount of inconvenience in flouting the Joint Board by amalgamating with other branches of the industry to enforce demands much more unreasonable than those which employers in some parts of the country still refuse to pay?

Happily some of our colleagues have had the benefit of the award being paid immediately after the Joint Board's recommendations were known. Others, unfortunately, find at the moment their employers hang great stress on the month in which these recommendations were made, *i.e.*, "May." The time, however, is rapidly approaching when this will read "shall" or "have."

Optimist.

December 4th, 1920.

I read the letter of "Sussex" in your issue of the 26th ult. with interest and surprise; the latter because I see no reason why the E.P.E.A. and the E.S.C.A. should not join forces, and it appears inconceivable that anyone in the electrical undertakings should have any misgivings on that score. Without the individual work of the members of the E.S.C.A. the E.P.E.A. would cease to exist to some extent, inasmuch as if consumers of electric light or power were not "obtained" and "retained" by the commercial side of each undertaking, no technical officers would be required to generate the "juice."

As it is the hope of reward that sweetens labour, I do hope the two associations will combine and go forward to uplift the members, who have hitherto borne the heat and burden of the day, insufficiently paid, and looked upon as necessary evils.

Outdoor Representative.

December 6th, 1920.

Your correspondent "Sussex" very lightly touches the point when he speaks of the dissatisfaction of the clerical and commercial staffs of our industry. When the award of May 12th, 1920, was agreed to by the National Joint Board (composed of employers and employés) it was naturally thought that it would be honoured. Instead of this the employers of the London companies repudiated their representatives and refused to recognise the Board or its findings. This was no act of Englishmen. Nationally we are supposed to possess sporting proclivities. The award is not now a claim; it has passed beyond that stage. It is an agreement which the employers have failed to carry out.

The staffs in the provinces are in a very similar position to those in London. We are not only dissatisfied, but extremely disgusted and embittered, and I hope no stone will be left unturned to force the employers to act the part of honourable Englishmen.

It is quite time that our Associations brought pressure to bear upon Parliament to give to the Joint Boards the compulsory powers of a Court.

If employers are allowed to flout their agreements in this disgusting manner, then the support of Ministries becomes a farce.

I echo the suggestions of "Sussex" that combined action should be taken by the E.P.E.A. and the E.S.C.A., as constituents of the Joint Board, for the interests of both are identical.

We are fighting to uphold principles of equity and justice which have been universally approved, and which have found so far their best expression through "Whitleyism," and there should be no question of compromise.

London.

London.
November 30th, 1920.

Your correspondent "Sussex" is to be congratulated upon his lucid statement of the position of the E.S.C.A. in this matter, and I write to support his suggestion that concerted or joint action be taken with the E.P.E.A. "Sussex" may well say that he is mystified as to why this action has not been taken—in face of the constitution of the National Joint Board, it would appear to be the only course possible.

Apart altogether from the question of honouring agreements, the demands made by the two associations cannot be considered anything but moderate measured by the standard of any other industry in the kingdom, and I feel sure that all members of the E.S.C.A. are with me when I say that it is our duty to stand in with the E.P.E.A. at this crisis, and to fight with them for the existence of the National Joint Board and the fulfilment of its agreements.

The amazing part of the whole business is the attitude of the employers to the National Joint Board, as compared with their attitude to the National Joint Council. The agreements made with the latter are promptly and faithfully honoured, although they are for the most part well in advance of anything asked for by the former. Now, by what process of reasoning does an employer feel called upon to honour an agreement made with the men who joint up his mains and control his switchboards, and yet break those made with the men who distribute his load and prepare his balance sheets?

The members of the E.P.E.A. and E.S.C.A. are moderate men, but they should leave no stone unturned to obtain the elemental justice they are seeking at the present moment.

Essex.

December 1st, 1920.

Power Factor.

In publishing my letter of the 29th ult. an error was made. The words "as the current in the neutral is 2 × current in outers" should read "$\sqrt{2}$ × current in outers."

E. W. Dorey.

Hemel Hempstead.
December 4th, 1920.

I wish to thank Mr. E. W. Dorey for his criticism in last week's ELECTRICAL REVIEW of my article of the previous week.

However, he accuses me of having made a slip when considering two-phase power measurement with regard to a two-phase, three-wire system.

Mr. Dorey tells us that the current in the "neutral wire" of a two-phase, three-wire system is "2 × current in outers," whereas the current in the common wire is actually—when the load is balanced—1.414 times the current in the outers. Mr. Dorey might have meant $\sqrt{2}$, or the printer might have made the slip. I will therefore give Mr. Dorey the benefit of the doubt.

Still, may I point out to Mr. Dorey that the current in the "neutral wire" is not the current of *one phase*, but is the vectorial sum of the current in *both phases*, so that the current of each phase is the current in the outer wire of that phase. This makes my statement quite correct as it is written in the REVIEW. Also, does Mr. Dorey think that I think that the difference between 1.414 times the current and 1 time the current will give an approximate indication? My method of finding the power factor of the two-phase supply—three-wire or four-wire—is not approximate as Mr. Dorey thinks, but is accurate to three or four per cent., which is accurate enough for practically all power-factor measurement. Although I used the word "wattmeter" throughout my article, there is no reason why an integrating kilowatt-hour meter should not be used, for as a matter of fact this is the type of instrument I nearly always use, as there are usually more of these instruments available than indicating wattmeters, the meter disk being timed for about a minute. Mr. Dorey goes on to tell us the method of finding power factor which he uses, although I fail to see how—if the load is varying to any considerable extent—he obtains the "average current." He may obtain the average power over the period considered (15 minutes), but it is impossible to obtain—with an ordinary ammeter—the average current with the same degree of accuracy. His method is very approximate, and will be even more so when dealing with polyphase unbalanced loads.

Also may I point out that Mr. Dorey obtains KW. by multiplying 10 units by 4. He should really obtain 40 units, or 40 KW.hours. Of course if a suitable voltage, from another source, than that from which the current of the circuit is taken is not available, my method of finding the power factor of the system is of no use, and we come back to the ordinary voltmeter, ammeter, and wattmeter method, which is more or less the one used by Mr. Dorey, only he uses an integrating KW.-hour meter instead of the indicating wattmeter.

D. Sclar.

Cowdenbeath.
December 6th, 1920.

The I.E.E. Subscriptions.

Having had the opportunity of attending the extraordinary meeting of the I.E.E. on Thursday evening last, I should like, as a provincial member of twelve years' standing, to be allowed to make one or two comments in support of the principles of fair play at such meetings.

It was, of course, quite obvious that the Council had carefully prepared an excellent case for the defence, so that any opposition encountered would have had to be extremely well organised in order to attain success.

The president having announced at the conclusion of his speech for the defence that he hoped no comparisons would be made between the I.E.E. and the other two sister Institutions, it was certainly unfortunate that towards the close of the meeting the hon. treasurer should have had a lantern slide thrown on the screen, making financial and numerical comparisons between the I.E.E. and the I.Mech.E. in order to show the former Institution to advantage!

As a provincial member who has been connected at various times with the three most important territorial centres, I must confess that I was more than ever convinced of the lack of professional status that still exists in the Institution as a corporate body, despite the Council's contention ever since 1912, that the I.E.E. possesses an undoubtedly high status in the engineering profession.

It was most regrettable to hear one member howl out: "Go back to West Ham" whilst Mr. Purse was pressing his case against the Council's resolution, and another member's, "Hear, hear," at a later stage of the proceedings, was so obtrusive that the president (as a gentleman) was compelled to stop his speech to query the offending member's exclamation!

Whilst holding no briefs for Mr. Purse or his supporters, I feel that their criticisms were entitled to at least gentlemanly consideration from the meeting, which was being ably presided over by Mr. Atkinson, without the impromptu assistance of the body of members.

Finally, it seems evident that there is still an appreciable amount of dissatisfaction existent amongst the membership, and although these frank criticisms of the administration of the Institution are really a healthy sign for its future welfare, it is to be sincerely hoped that the present Council will give serious consideration to a great many of the points raised at last Thursday's meeting.

A.M.I.Mech.E.

London.
December 4th, 1920.

Doubtless the special meeting held on Thursday evening with regard to the proposed increase in subscriptions will receive your usual attention, but I would like to emphasise two points which definitely emerge from the discussion:—

1. That the Council held out very little hope of any cutting-down of the present rate of expenditure.

2. That the Council do not propose to entertain the suggestion of distributing any increase in cost equally or proportionately amongst *all members*, or to maintain the present differentiation in subscriptions or to increase the entrance fees, or to ask the life members to pay their share of the increased costs.

As it was shown that the journal alone will cost approximately £1 per member for the coming year, and the Student's subscription is to be kept at £1 1s. per annum, the inequality of the proposals is obvious.

As I still hold that an injustice will be done if the original proposals are carried, I must vote against them at the confirmatory meeting to be held on the 17th, and am willing to again receive any proxies from members holding similar views, but I must point out that a far greater number must be returned if any protest is to be effective.

Fredk. W. Purse,
Engineer and Manager.

West Ham Electricity Supply.
December 4th, 1920.

I should like to make the following comments on the proceedings at the special meeting of the Institution of Electrical Engineers on Thursday last. After the remarks of Mr. J. E. Kingsbury and the consent of Mr. W. R. Cooper to withdraw his amendment, it would have been a gracious act on the part of Mr. F. W. Purse had he respected the wish of the meeting, and allowed the resolution of the Council to be unanimously passed.

Mr. Purse has worked hard in this matter, and great credit is due to him, because many engineers who are members of the Institution take little or no interest in its affairs, but he would have gone up immensely in the estimation of the meeting had he consented to withdraw his amendment, or, alternatively, asked permission to leave the meeting with his fellow "conspirators." Those present were greatly annoyed by his unnecessary obstinacy.

The patriotic note struck by the President when he said: "Is the great work of the Institution to go on?" should be made to ring true throughout the industry. There are small matters of difference arising out of the discussion at the meeting, but members generally may have confidence in the Council to satisfactorily adjust these to all concerned.

W. E. Warrilow,
Associate Member.

London.
December 6th, 1920.

Shop Displays.

The letter signed "Retailer" and headed "Shop Displays" in your last issue refers to a matter which surely demands the serious attention of the manufacturers and distributors, as the electrical contractor has been suffering too long under the handicaps complained of.

A short while ago members of the E.C.A. were asked to consider signing an agreement to purchase goods from certain firms in return for their guaranteeing to give a small preferential discount to contractors signing the same, and the E.C.A. was good enough to publish our letter in the last issue of the *Electrical Contractor;* we venture to hope that the ELECTRICAL REVIEW will be good enough to similarly publish our letter, as under, in the hope that it may assist to the same ends as "Retailer" has in mind, *i.e.*, to obtain similar treatment for the contractor as is meted out to the retailer in other trades.

COPY.

The Electrical Contractors' Association.

Dear Sirs,

In reply to yours of the 28th ult. with enclosure, we feel that if such an arrangement as the one suggested is necessary in order to ensure "trade terms" to the genuine trade (*i.e.*, those that buy to sell again) to the exclusion of all others, then it is quite time that contractors woke up and refused to purchase from manufacturers and wholesale firms found supplying "users." A certified black list of such firms, kept up to date, might be supplied by the E.C.A. to all members, who should undertake to cease business relationship with offenders.

We may be in error, but we have never heard of any other trade having to bind itself to buy from a "few" manufacturers in order to obtain some measure of protection against direct selling to "users."

Take the motor-car business—a later one than our own. Can an electrical contractor buy motor-car accessories, or even a car lighting dynamo, from the manufacturers or wholesale house at trade terms? Not unless he *proves* that he runs a special department for motor-car work and sales, and in any case the "user" is not supplied at trade terms. Yet, in our own industry, the users are energetically *canvassed*! What a disgraceful condition of affairs!

We have nothing whatever to say against the individual firms you mention in your communication; on the contrary, we doubt if one of them would knowingly or willingly pass by the contractor, but even they cannot close their eyes to the position as it stands to-day.

Under the circumstances, therefore, we are not in favour of the "Agreement."

May we ask you to publish this communication in the next issue of the ELECTRICAL CONTRACTOR, and to invite correspondence on this subject?

Yours faithfully,
J. & T. ROBINSON, Croydon.

Croydon.
December 6th, 1920.
J. & T. Robinson.

In the current issue of the Electrical Review I was interested in "Retailer's" letter and the Editors' foot-note. One wonders at the futility of complaining if precisely the same action was taken 19 years ago through your columns, when even now retailers are daily subject to the annoying practice stated.

I certainly agree that *bona fide* retailers of electrical goods should have some protection. One would naturally look to the wholesalers, who are dependent on the retailer for the bulk of their business, to adopt a more businesslike principle which would naturally offer more encouragement to the retailer.

I could quote numerous cases where electrical plant, fittings, lamps, &c., have been supplied direct from manufacturers and wholesalers to so-called "trade users" on the same terms as my own company, who are *bona fide* retailers. I know a man who was until recently connected with the pottery industry, who opened a shop for the sale of games, sports, &c., and as an extra has taken up the sale of various electrical goods, which have been supplied at trade terms. The man made application to us for the supply of electric lamps at "trade terms"; needless to say he was not supplied by us, but it would be interesting to know who did supply him.

Anotherofem.

December 6th, 1920.

I was very interested in the letter of "Retailer" in your current issue, and am somewhat at a loss to understand his real position. The tone of his letter leads me to think he is a small wiring contractor who is scarcely strong enough to take his own part against unfair competition, and yet has not joined the "one body" which is capable of, to a great extent, guarding his legitimate interests, viz., the Electrical Contractors' Association.

If "Retailer" is not a member of the E.C.A., then let him please take a little good advice and join without delay; but should it be that he is a member and not in touch with what is being done in the country in connection with some of the points raised, I shall be pleased to enlighten him, through his branch secretary. (My name and address is in the editors' hands.)

"Retailer" talks of a London meeting to prepare a way for an organisation which would spread to the provinces, but I would respectfully remind him that an organisation has already been formed in the provinces, and with this, as with many matters political, what the North says and does "to-day" London will say and do "to-morrow."

The organisation to which I refer is a combination of wholesalers and contractors (that is strange, isn't it "Retailer"?) to scrutinise all applications for trade terms, and, unless such applicants can prove to the utmost satisfaction of the committee appointed that they are carrying on a genuine electrical contractor's business, having stocked premises, business stationery, &c., then no trade discount is given by the wholesalers. In other words, a man or firm cannot get trade terms unless his name appears in the "approved" list.

This cuts out the class of "electrical contractors" mentioned by "Retailer," men who work for firms and public bodies in the daytime and try to carry on contracting work in the evenings, and a host of other small but injurious fry, and will go a long way to eliminate dangerous and unfair competition for the contractor, give more confidence to the factor and wholesaler when letting his goods leave his stores, and create a better spirit between the two branches of the trade concerned, which is bound to result in more business for the local factor, prices and quality being equal, and make the business relationship between the two bodies run a smoother course.

Regarding the sale of lamps to users by hawkers, who, apparently, do nothing else, this is one of the very worst features in the electrical trade to-day, and the one that will be the most difficult to stop, but the time will come.

We, the Electrical Contractors' Association, are a very powerful organisation to-day, and daily increasing in strength, and much has been and is being done by working agreements with the other bodies in the electrical trade to "lift" the trade up and keep it up, and purge it of a lot of those methods which have in the past been detrimental to the best interests of the trade in general.

Provinces.

December 6th, 1920.

A Suggestion for Instrument Makers.

I have often wondered why makers of recording instruments, time switches, or any instruments employing clockwork for driving gear do not produce models fitted with a regulation dial and hands, so that the apparatus may be used as an ordinary clock in addition to the fulfilment of its ordinary function. For instance, a recording voltmeter combined with a clock would be very useful in a generating or sub-station, while at important points time switches combined with clocks fitted on lamp-posts would be a considerable public convenience.

Such an addition would not make a very serious increase in the cost of production—certainly much less than the combined cost of a clock plus one of the instruments mentioned above.

Wm. J. U. Sowter,
Engineer and Manager.

Electricity Works, Bray.
November 30th, 1920.

The Crisis in Electricity Supply.

The letter from "Electricity Undertaking" in your "Notes" columns this week induces me to raise a point which has, I think, not yet been mentioned publicly.

Your correspondent says that the associations of municipal and company undertakings were never authorised to negotiate a schedule of salaries. According to the reports of the I.M.E.A. Conference at Ilkley in June last, a resolution was unanimously adopted that all constituent members should be recommended to abide by the awards of the National Joint Board.

Why did not the representatives of the objecting undertakings raise the question of lack of authority at this time? Surely the business meeting of the I.M.E.A. was the proper place to inform those gentlemen who gave a great deal of their time to arrive at a settlement that they had no authority to do any such thing.

An answer to this question would interest many people, including the ratepayers at whose expense the engineers and committeemen went to Ilkley.

Query.

December 4th, 1920.

Whilst there is much to be said for the decision of the Council of the E.P.E.A. to withdraw members from undertakings that have paid the schedule salaries as well as from those that have not, there is also, as you point out in your current issue, something to be said on the other side, and I should like to suggest, if it is not too late, that the object of the Council in adopting this course, namely, ensuring the active influence of the paying undertakings on the non-paying ones, might be secured by the Council leaving these men at work provided each undertaking gave some genuine promise and assurance of its active support of the cause of the E.P.E.A.

I am, of course, fully aware that the Council has had promises before, some of which have been dishonourably broken, but the people I now refer to are those who have already proved their honour.

Pollux.

Port Talbot.
December 5th, 1920.

As a junior engineer I should like to reply to the last sentence of "Electricity Undertaking's" letter regarding the training and qualifications of *some* juniors.

Evidently "Electricity Undertaking" is one of those persons who expect men to spend half their lives, and fabulous sums, in training for positions at salaries which self-respecting dustmen would not accept.

In this district (where I write) I should be ashamed to let any labourer know just what my salary is, for I should be deemed every kind of an idiot for working the hours I do for such a paltry sum.

Even a junior can, quite reasonably, expect to live, and live decently, and, in my opinion, the nutritive qualities of fresh air are strictly limited.

Another point in your correspondent's letter relates to the "self-constituted (so-called) National Joint Board."

This N.J.B. is an entirely disinterested body, recognised by the Ministry of Labour, appointed for the sole purpose of revising the salaries of technical staffs and awarding a reasonable increase, due to the cost of living. The reasonableness of the award did not depend on the number of undertakings represented or the number of units sold; it was decided by disinterested parties on the purchasing power of the £. I ask you, Mr. Editor, how can E.P.E.A.-ites treat with "the other side" when we have such men to deal with who, after their representatives have accepted the findings of the N.J.B., calmly say, "There is no question of dishonouring an agreement, as no agreement has been made"?

I might add that I stand to get nothing out of the schedule; there are others. It is so easy to throw stones from the mountain top to the detriment of the climbers.

Junior.

December 6th, 1920.

Electric Vision.

In the course of my recent presidential address to the Institution of Electrical Engineers, I referred to the question of electric vision, and indicated briefly the methods by which I think success might be obtained at the present time.

My friend, Mr. Campbell-Swinton, has called my attention to an address delivered by him in 1911 to the Roentgen Society, dealing also with the subject of electric vision, and proposing methods of working substantially identical with that suggested in my address. I am glad to find in a conversation I recently had with Mr. Swinton that he agrees

with me that the development of wireless transmission and the valve amplifier carries the proposal a long way towards practicability.

I desire, however, to call attention as early as possible to Mr. Swinton's work in this direction.

L. B. Atkinson.

London.
December 6th, 1920.

An Engineers' Club for London.

I have read with much pleasure the letter in your current issue from "M.I.E.E.," and am delighted to hear that it has your cordial support. It will certainly have mine in both a personal and an editorial sense, and I may add that as secretary of the Kelvin Masonic Lodge, which is so intimately associated with the engineering profession and industry, I have frequently been chaffed by provincial visitors on the lack of such a club in the Metropolis. It would, I am certain, meet with hearty good wishes and real support from a very large number of engineers, electrical, mechanical, consulting and commercial.

Sidney Rentell, A.M.I.E.E.
Editor, *Electricity*.

London.
December 6th, 1920.

[Other communications have been received on the same lines, and the prospects for the movement seem distinctly favourable. We await further postcard "votes."—Eds. Elec. Rev.]

A Drying Cupboard.

Your correspondent "Puzzled" appears to have made the usual error in home-made drying apparatus, *i.e.*, the proportion of heated air to the area of the cupboard and also the temperature to which the air is heated.

We enclose a leaflet describing a drying machine which is used for drying various classes of material; the fan, which is the only moving part, maintains a suction equal to from 3 in. to 5 in. water gauge, but the outstanding feature of this machine is that each chamber is at a different temperature.

Your correspondent might surmise that such a current of air would disarrange his films, but we would mention that this machine successfully dries silk in the hank suspended on poles, and when this material contains 60 per cent. of moisture will dry it in approximately 40 minutes.

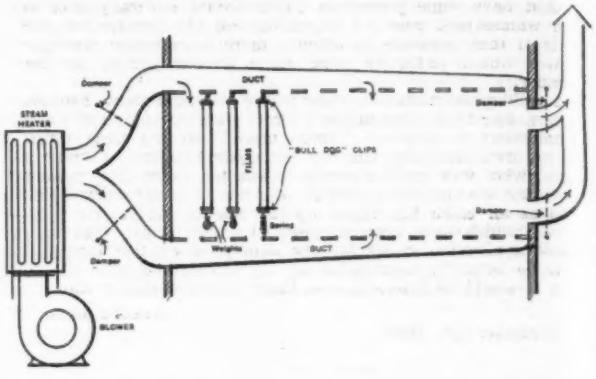
Tomlinson-Haas, Ltd.

Manchester.
December 6th, 1920.

"Puzzled" has a problem which he has tackled electrically, where really it should have been done in quite a different manner.

The wholesale drying of films is not easy; in the first place, the draught must not be sufficient to waft the films, as, if two happen to touch, they can never be separated without damage to either or both. Secondly, the admission of air "just above the floor level" is bad, as dust will be raised from the floor and deposited upon the wet films. The fire risk is also considerable, and the heating should be carried out away from the film cupboard.

This problem was successfully solved by the writer some years ago by the following means:—



The films are held by "bull-dog" clips on hooks fitted into the ceiling, and a second similar clip, heavily weighted, or attached to the floor by means of a light helical spring, holds the films taut and incapable of movement by the air currents.

Air in large quantities at low velocity is drawn over a battery of steam-heated tubes in a sheet-iron casing and distributed through a taper duct under the floor, with numerous inlets controlled by dampers. A similar duct on the roof of the cupboard allows of the reversing of the air, and a vertical outlet, from top to bottom, will carry away the moisture-laden air.

This method of working will bring the hottest and driest air in contact with the bottom of the film first, which naturally remains moist by drainage.

After about 30 minutes of this treatment the dampers should be reversed, allowing the air to enter at the top and leave at the bottom. By this means "Puzzled" may reasonably expect to complete the drying in about 45 minutes.

The use of calcium chloride screens would assist, but they are very "messy," and should only be resorted to as a last expedient.

E. G. Phillips.

Nottingham.
December 6th, 1920.

[Other letters, received too late, are held over to next week. —Eds. Elec. Rev.]

BUSINESS NOTES.

Christmas Holidays.—We shall be glad if our contributors and advertisers will take note that the issue of the Electrical Review for Friday, December 24th, will be published on Thursday, December 23rd. Our Advertisement Department announces that new copy and alterations to existing displayed advertisements should be received not later than Thursday morning next, December 16th. Official notices and small prepaid advertisements can be received up to 5 p.m. on Tuesday, December 21st.

For the issue of Friday, December 31st, new advertising copy and alterations to existing displayed advertisements should reach this office by Wednesday morning, December 22nd.

Bankruptcy Proceedings.—J. Harrison (Harrison and Son), electrical engineer, 93, Princes Street, London Road, Southend-on-Sea.—The public examination was held on December 1st at the Shire Hall, Chelmsford. The statement of affairs showed liabilities expected to rank for dividend amounting to £666, against assets nil. The debtor stated that he received two grants of £25 each from the Civil Liabilities Commission, and was fairly successful. Later, however, the business suffered owing to strikes in the building trade at Southend and a rise in the cost of electrical appliances. He lost something like £500 through paying wages to his workmen, when he might have discharged them on account of slackness of work during the strikes. A bill of sale had been given, and since that time he had obtained goods to the value of £287, in the hope that the business would improve. The examination was adjourned.

James Cruickshank Thomson, electrician, late electrical engineer and contractor, 34, Clerkson Street, late Station Street, Mansfield, Notts.—The public examination of this debtor was held on December 2nd at the County Court House, St. Peter's Gate, Nottingham. The statement of affairs disclosed liabilities amounting to £186, against assets of £116. Debtor attributed his position to want of capital, ill-health, and bad trade. He commenced business on his own account in December, 1918, with a capital of £200, with which he purchased stock. He found great difficulty in obtaining materials, and subsequently his health broke down. He stated that he had kept a cash book for the first nine months but did not continue it afterwards. The examination was closed.

J. W. Layton, electrician, Nobles Bank, Hendon, Sunderland.—Receiving order made December 1st on debtor's own petition.

G. E. A. Bonner, electrical agent, 105, Fox Lane, Palmer's Green, N.—Discharge suspended for six months, from October 22nd, 1920.

Company Liquidations.—T. Emery's Automatic Power Generating Motors Ltd.—Winding up voluntarily. Liquidator, Mr. C. Pillow, 392, Strand, W.C. Meeting of creditors, December 16th. Particulars of claims to be sent to the liquidator by December 16th.

Renshaw Generator Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. L. Waite, 24, Coleman Street, E.C. Meeting of creditors, December 15th. Particulars of claims must be sent to the liquidator by January 7th, 1921.

Walter Scott (Rock Ferry), Ltd.—Meeting is called for January 8th, at 19, Castle Street, Liverpool, to hear an account of the winding up from the liquidator, Mr. F. Richardson.

British Ever-Ready Co., Ltd.—(Voluntary liquidation for reconstruction purposes). Meeting is called for January 6th, 1921, at Hercules Place, Holloway, N., to hear an account of the winding up from the liquidator, Mr. W. T. Walker.

Butler & Wilson, Ltd., dealers in electrical appliances, &c., 18-20, Hampstead Road, Euston Road, N.W.—A meeting of the creditors of the above was held on December 3rd, at Winchester House, Old Broad Street, E.C. The chair was occupied by Mr. C. Sunderland, accountant, of 15, Eastcheap, E.C., who had been appointed to act as the liquidator in the voluntary liquidation of the company. The statement of affairs showed liabilities of £21 819, while the net assets were set down at £12,640, or a deficiency of £9,179. In addition to the liabilities mentioned, there were claims for Excess Profits Duty amounting to £939, which were not expected to rank. There were also claims in respect of breaches of contract amounting to £23,000. The com-

pany was registered in May, 1914, with a nominal capital of £500. In January of the present year, the capital was increased to £25,000, of which £16 7 10 had been issued. The company originally traded at Bradford, but with the expansion of the business, the chief offices were moved to London, and branches were established at Bradford, Glasgow, Manchester, Luton, and Cheltenham. The Glasgow and Luton branches were finally closed down, while the Cheltenham business was sold just before the liquidation took place. The Bradford and Manchester establishments were being closed down at the date of the liquidation, and the stocks had since been removed to London. In 1915 the company made a profit of £95, but during the following two years there were small losses. In 1918 there was a profit of £1,200, and in the succeeding 12 months a profit of £1,525. Accounts for the year to May, 1920, had not been prepared, but it was believed that since 1919 there had been a loss of about £6,000. The present position was thought to be due to unproductive expansion, and excessive overhead expenses. The company appeared to have over-reached itself, and entered into contracts which resulted in a heavy loss. The directors, who appeared in the statement of affairs as cash creditors for £3,500, had withdrawn their claims. Proposals had already been received for the sale of the assets. A resolution was passed confirming the voluntary liquidation of the company, and an informal committee of the principal creditors was also appointed.

Dissolutions of Partnership.—Sutcliffe & Williams, electrical engineers and contractors, 6, Wood Street, Cedar Street, Liverpool.—Mr. C. Sutcliffe and Mr. N. Williams have dissolved partnership.

Manchester Private Telephone and Electric Lighting Co., 25, Cooper Street, Manchester.—Messrs. A. Bonnan and B. T. Chonchol have dissolved partnership. Mr. A. Bonnan will attend to debts and continue the business.

Potts & Fawkes, civil and electrical engineers, 42, Baltic Chambers, Quayside, Newcastle-on-Tyne.—Mr. N. Fawkes and Mr. S. J. Potts have dissolved partnership. Mr. N. Fawkes will attend to debts and continue the business.

Trade Announcements.—The General Electric Co., Ltd., in view of the forthcoming removal of its stockrooms to its new premises in Kingsway, has issued instructions for the consignment of goods, which, if sent by rail, must not be forwarded to the city warehouses after December 17th; after Christmas they must be addressed to Magnet House, Kingsway, W.C. For goods forwarded by road, other instructions are given. After January 3rd all goods usually delivered to the city warehouses must be sent to Magnet House, but all correspondence invoices, &c., must be addressed to 67, Queen Victoria Street, as usual. Goods for the Union Street warehouses are not affected by the instructions.

The Mirrlees Watson Co., Ltd., has transferred the London office to Mirrlees House, 7, Grosvenor Gardens, S.W. 1. Telegrams: Mirrlees, Sowest, London. Telephone: Victoria 9123.

The Imperial Electrical Works, 7-12, Imperial Mews, St. Martins Avenue, East Ham, state that their telephone number is East Ham 101.

Messrs. S. G. Leach & Co., inform us that they are the sole selling representatives for Great Britain for cables and wires manufactured by the Holland Cable Co., Amsterdam, Holland.

The National Engineering Supply Co., electrical and mechanical engineers, 1, West Bute Street, Cardiff, have moved their Cardiff stores to 139, Bute Street. The offices will still be situated at 1, West Bute Street.

Mr. J. Russ has opened premises at 30, Maiden Lane, Covent Garden, London, W.C. 2, to trade in electrical supplies of every description. Manufacturers are invited to forward catalogues and best cash terms for their specialities.

The Enterprise Manufacturing Co., Ltd., of Gun Street Electrical Works, Bishopsgate, owing to considerably increased business on the North-East Coast, has appointed Messrs. T. H. Raines & Co., of 10, Neville Street, Newcastle-upon-Tyne, to look after its interests in that territory.

Catalogues and Lists.—L. G. Hawkins & Co., 116, Charing Cross Road, W.C. 2.—Pamphlet No. 443, a folder illustrated in colour relating to "Universal" electric toasters and other domestic appliances.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, W.C. 2.—A series of leaflets dealing with wireless apparatus:—L 110/4, ½-kw. wireless telephone and telegraph cabinet; L 131/2 and L 132/2, "Type 55" amplifier, description and instructions; L 141/2, Marconi standard wavemeters; and L 153, "Type 89" double-note magnifier. All photographically illustrated.

The Consolidated Pneumatic Tool Co., Ltd., Egyptian House, Piccadilly, W.1.—A folder illustrating and describing a new and simple hose coupling.

Hamilton's, Ltd., Coventry.—Two leaflets dealing with stands at exhibitions, in which direction the firm are specialists. One bears an illustration of a stand erected by Hamilton's, with copies of testimontals from clients.

Petters, Limited, 117-123, Great Portland Street, W.1.—Two leaflets and two folders illustrating and describing "Vickers-Petter" and "Petter Junior" oil engines and "Petter-Light" electric lighting sets.

The Wardle Engineering Co., Ltd., Elsinore Road, Old Trafford, Manchester.—Booklet No. 7, "Good Lighting." An interesting little magazine containing a number of useful notes on lighting, &c.

W. T. Henley's Telegraph Works Co., Ltd., Blomfield Street, E.C. 2.—Leaflet U.110, illustrating and describing the "Dickinson" patent cover for underground joint boxes.

The Overseas Engineering Co., Ltd., 163-165, Great Portland Street, W. 1.—List 15, illustrating and describing the "Overseas" small electric lighting and power sets; and List 31, an illustrated and priced leaflet of "Overseas-National" pumps, with copious notes of great utility.

Inquiries.—Makers of Wallis-Jones, Corse & Roseburn, or any other good form of automatic earth leakage cut-outs for D.C. power circuits, are required.

Makers of an H.O. pattern fuseboard bearing the registered No. 598,930 on the fuse bridge and of "Ambroin" insulating material are also asked for.

New Belgian Company.—La Société Franco-Belge d'Electricité is the name of a new company which has lately been formed in Charleroi, with a capital of 1,650,000 fr., to carry on an electrical engineering business.

The Training of Ex-Service Men.—According to a *Times* report, Dr. Macnamara, in a written reply to a Parliamentary question, stated that he was aware that dissatisfaction existed among ex-Service men regarding the rate at which facilities for training were being made available, but he did not think that there had been such delays in the cases of men whose apprenticeships had been interrupted by war service. Initial difficulties in the acquisition of suitable buildings had been largely surmounted. The number of ex-Service men, apart from men whose apprenticeships had been interrupted, awaiting training was 28 000 on March 1st, and this number had been reduced to 17,000. Of these, nearly 5,000 new names had been added to the list during the last two months. The number of men training in January last was about 17,000; the present figure was over 25,000. Since August 1st, 1919, between 20,000 and 21,000 men had terminated their training. As regarded men whose apprenticeships were interrupted, of 44,827 agreements received, 42,868 had been accepted, 1,809 having been refused; 29,391 apprentices were still in training, and the agreements in the remaining 13,477 cases had terminated satisfactorily in most cases.

Lead Report.—Messrs. James Forster & Co., writing on December 4th, state:—Early in the week just ended, the tone of the market was very flat, prompt lead being sold down to £25 and forward £25 15s. On Thursday it recovered to £29 5s. for prompt and £29 15s. for February and March. Germany is still sending small parcels of lead, as the exchange remains favourable for export, but France has ceased selling for the present, having now disposed of her surplus holding. Shipments from Australia are expected to arrive in February next, should no fresh difficulties or labour troubles arise. There has been a little export demand, with continued inquiries from Japan and China. The outlook for the moment is rather uncertain. The demand for other metals, however, has revived considerably, and lead will probably share in the general improvement, as the position of lead looks undoubtedly sound. Closing prices were as follows:—Prompt and December, £27 5s.; January, £27 10s.; February and March, from £27 15s. to £28.

Wages and Salaries.—The Industrial Court has ruled that electrical fitters, electricians, wiremen, plumber-jointers and armature winders employed on railways in the London district, if engaged in installation work ordinarily carried out by electrical contractors, shall be paid at the rate of 1s. 4d. per hour, plus 3½s. 6d. plus 12½ per cent. for a week of 47 hours, or a total of 2s. 3¼d. per hour. "Mates" of men so engaged are to be paid at corresponding rates. The award is applicable from October 1st.

Newcastle City Council has agreed to the new Civil Service scale of war bonuses recently granted to its staff being extended to the tramway department. This means bonuses of £40 to £60 per annum, according to staff grade. The general manager's remuneration will be increased from £1,600 to £1,750, while the same increase of £150 per annum will be paid to the assistant electrical engineer, the assistant mechanical engineer, the rolling stock superintendent, the chief clerk, the accountant, and the traffic superintendent.

The following are the returns of the ballot vote taken in respect of the offer of the employers for advances of wages to employés in electricity undertakings in No. 10 Area (Greater London):—

	For.	Against.
E.T.U.	1,484	1,028
N.U.G.W.	784	172
Enginemen and firemen ...	895	217
W.U.	328	388
Miscellaneous	132	5
M.E.A.	10	11
E.T.U. (late returns)	135	136
	3,768	1,937

On November 30th 3,500 tramway workers employed by the Manchester City Council applied for an advance of £1 a week, reporting that they were not satisfied with the National Tramway Workers' application for 16s. The Committee replied that they could not disassociate themselves from the National Industrial Council, and refused the increase.—*Daily Telegraph.*

Trade Union Amalgamation.—At a meeting on December 1st, the delegates of 19 Trade Unions affiliated to the Transport Workers' Federation resolved to combine in one Union, representing half-a-million members. A ballot is being taken on this resolution. If it is confirmed, the new organisation will possess a national executive with power to declare a strike, like the other members of the "Triple Alliance."

Ediswan Social and Dinner.—On the 1st inst. the staff of the Bristol depôt of the EDISWAN ELECTRIC CO., LTD, held the first of a series of socials in the company's showroom. Mr. Fifield, the district manager, presided, and an informal programme of music was given by the Misses Gratton and Lewton, and Messrs. Dingle, Hunt, and Griffiths. Dancing followed, and a very enjoyable evening was brought to a conclusion by the singing of "Auld Lang Syne."

The company's fire brigade, which is one of the oldest private fire brigades in the country, held its annual dinner in the Staff Café at the Ponders End works on the 3rd inst. About 60 sat down, under the chairmanship of Dr. C. E. Hiatt, the chief guests of the evening being the members of the Ponders End Fire Brigade (Enfield U.D.C.), who brought their motor fire engine with them in order to be prepared for any emergency. The remainder of the evening was devoted to an excellent concert given by members of the Ediswan Girls' Musical Association and the Ediswan Entertainers.

A Commercial Travellers' Union.—It may be recalled that at the annual Conference of the United Kingdom Commercial Travellers' Association, in August last, at Cambridge, a resolution for the reconstitution of that Association as a Trade Union was defeated. As a result of that vote, a Commercial Travellers' Trade Union Propaganda Committee was formed, and in view of the U.K.C.T.A. being incorporated under the Companies Acts, and forbidden by those Acts to take any action "which, if an object of the Association, would make it a Trade Union," a ballot was taken of the members of the Committee referred to, as to whether steps should be taken to form a Commercial Travellers' Union. The replies were almost wholly favourable, and steps have been taken to form the Union, under the title of the National Union of Commercial Travellers. The Executive Council of the new Union are all members of the United Kingdom Commercial Travellers' Association, and Mr. C. J. Kebbell, Honorary Secretary, National Union of Commercial Travellers, St. Bride's Institute, Bride Lane, E.C. 4, will be pleased to hear from travellers interested.

The E.P.E.A. Award.—The Wimbledon Corporation, seeking to anticipate the action of members of the technical staff at the electricity works, gave them notice to leave. The staff retaliated with a threat of an immediate strike. Finally, through the intervention of the Minister of Labour, the whole of the question was held over for later discussion.

A meeting of the National Joint Board of Employers and Staff Members of the electricity supply industry was held on December 4th, when figures showing the state of affairs were given. It appeared that of a total of 219 undertakings which had been communicated with regarding the decisions of the Board, 101 had accepted the terms without question, while 20 had accepted them with certain reservations or conditions. On the other hand, 28 had refused to give effect to the new rates, and 90 had failed to reply to the communication. These, it was presumed, were also against acceptance. It was pointed out, however, that the assenting undertakings were generally the larger undertakings—in fact, Alderman Walker, of Manchester, chairman of the Board, considered that these represented 70 per cent. of the total electricity supply of the country. It was pointed out in a leading article, which appeared in our columns last week, that the withdrawal of staffs from undertakings which had agreed to accept the schedule was an unfair procedure. This has now been remedied, and only councils and corporations hostile to the schedule will be affected by a strike if it comes to that. Several London supply companies have raised the question of the competency of the Board to propose any sort of standardisation of wages, but the Ministry of Labour supports the Board, whose *status* is thereby practically assured.

Mr. T. W. Cole, Secretary of the Provincial Electric Supply Committee, in a contribution to the *Financier*, says that a recommendation was sent out to all member-companies, about 120, to adopt the schedule if their financial position enabled them to do so. He further states, however, that a large number of the provincial supply undertakings are in such serious straits that it will be impossible for them to pay the increased salaries unless charges to consumers are raised, and most of them are already charging the statutory maximum. The whole crux of the matter, therefore, is whether the Ministry of Transport will sanction further tariff increases to meet the demands of the E.P.E.A. Mr. Cole says that it is only fair to note that in a number of cases where the schedule has not been fully adopted, local conditions are such that a corresponding modification of the national schedule is necessary.

The Unemployed Problem.—A deputation from the National Alliance of Employers and Employed was introduced to Dr. Macnamara, on Wednesday last, by Mr. E. Manville, M.P., to discuss the unemployment problem.

Wages in the Tramway Industry.—According to the *Westminster Gazette*, a deadlock occurred at the Conference at the Ministry of Labour, which met, on Tuesday, to consider a proposed wages increase for tramway workers all over the country. The employers refused to consider any advance, or to agree to arbitration, and left the Conference. The application was a national one for an increase of 12s. a week for adult tramway workers employed by municipal undertakings all over the country.

A Sub-Committee of the workers' representatives was appointed to decide what should be the policy of the Unions involved, in view of the breakdown. Mr. J. Beckett, secretary of the Municipal Tramways Association, stated that the considered reply of the municipalities was that they could not accept arbitration, and that the undertakings, owing to their financial position, had reached the limit in the way of wages advances. The situation was considered to be a serious one.

Foreign Samples Exhibition.—On December 7th, Mr. F. G. Kellaway, Parliamentary Secretary of the Department of Overseas Trade, opened the Foreign Samples Exhibition, which has been moved from Basinghall Street to Old Bailey. In his speech Mr. Kellaway said that the most important post-war problem was the recovery of British trade supremacy in foreign markets. Britain's overseas trade was her breath of life, and there had been already a most remarkable recovery, chiefly due to a period of many buyers, which phase, however, had now passed. Those manufacturers and exporters who had taken the Government's advice, and set aside a certain proportion of their goods for foreign markets, were now reaping the benefit. The Department of Overseas Trade, a purely advisory body, with no powers of control, was, in a sense, the most important Government Department, and it was certainly the least expensive. The Exhibition enabled British manufacturers to see what was being done by foreign competitors, and to make an effort to produce better, or equally good, wares at competitive prices. Trade Union representatives had also received valuable impressions from visits to the exhibitions arranged in the various industrial centres of the country. Mr. Kellaway acknowledged the assistance given by Chambers of Commerce in arranging the samples, and particularly by the London Chamber, whose president, Mr. Stanley Machin, was present.

The scope of the Exhibition is a very wide one, ranging from toys to agricultural implements. The samples of an electrical nature are, for the most part, small—such as lighting fittings, cut-outs, cartridge fuses, telephone material, insulators, &c. Several samples of telephone and other cables appear. The Department is to be congratulated on the number of examples shown, and also upon the vast amount of information which has been collected with them.

The Advertising Exhibition.—The exhibition has been so successful in some ways that it is to become an annual event. Over 160,000 people paid for admission, and other visitors numbered 100,000. Even on the 5s. day the attendance was 10,000. Eminent visitors have described the exhibition as a brilliant success, an extraordinarily fine display. Sir Eric Geddes said, according to the *Daily Telegraph*, that the exhibition was far more instructive and pregnant with great results for the trade of the country than anyone who did not study the subject could possibly have believed. Many people were of opinion that advertising meant a great additional cost on the articles that were being sold; that was quite a false view to take. They were too apt to think and speak as if all expenditure was waste. He did not believe that was true. If money were spent skilfully and successfully on advertising, he regarded that was wise economy, because they could not sell anything without advertising, and bad advertising was detrimental to business. On the other hand, good advertising saved commercial travelling and incidental expenses. He believed the traders of the country were ignorant of what good advertising meant. He appealed to all manufacturers and others, not to look upon the enterprise as something light and entertaining, but as an undertaking vital to the success of our trade, especially in the present difficult times through which the country was passing. He wished great success to this new industry, which he felt sure would become a great power in the future development of the country.

A Pan-American Postal Union.—An important convention has been provisionally adopted, embracing all the American States, except British territory, in one Postal Union. As a result of this, United States manufacturers will gain an important advantage over their European competitors in the shape of cheap postal rates in correspondence with South America, as well as with Spain, which has been admitted to the convention.

Catalogues for Spain.—The Department of Overseas Trade informs us that the British Vice-Consul at Garrucha (Mr. A. W. Harrison) reports that the Sociedad Hidro-Electrica Espanola has been granted permission to supply electricity from the power station at Albacete to the Sierra Almagrera, Province of Almeria, for the purpose of providing additional power to the numerous silver lead mines, and that there is likely to be a demand for electric mining plant. While there is no actual demand at present for such plant, the Vice-Consul is desirous of receiving catalogues from United Kingdom manufacturers and exporters in order that he may be in a position to support their interests when the demand arises. Catalogues should be addressed to the British Vice-Consul, British Vice-Consulate, Garrucha, Spain. The Department will be glad to be advised of any action taken in the matter.

Smithfield Club Show.—At this show, which is being held at the Agricultural Hall, Islington, MESSRS. PETTERS, LTD., are exhibiting several of their "Petter Junior" small lighting and power sets. These include portable, semi-portable and stationary types for paraffin fuel. 18 and 25-B.H.P. crude-oil engines are also on view, as well as pumping sets.

A National Whitley Conference.—A National Conference of representatives of Joint Industrial Councils and Interim Reconstruction Committees was to be held at the Ministry of Labour, on Wednesday last, in connection with the proposed organisation of a National Whitley Association. The Conference was to be presided over by Mr. Sydney W. Pascall, and opened with addresses by the Right Hon. J. H. Whitley, M.P. (Deputy Speaker, House of Commons), and the Right Hon. Dr. T. J. Macnamara (Minister of Labour). The delegates were to be entertained at luncheon by the Industrial League and Council, which has done much to help forward the Whitley movement.

Book Notices.—*Journal* of the British Science Guild, No. 12, November, 1920, (65 pp.) contains addresses by Lord Sydenham on "Science and the Nation"; Lord Montagu of Beaulieu on "Some National Aspects of Transport"; a short article on "The Scientific Research Department of the Admiralty; Its Establishment, Scope and Aims"; and papers on "The Human Factor in Industry," "Primitive Economics," and "Industrial Psychology." Price 1s. 1½d. post free, obtainable from the Secretary, British Science Guild, 6, John Street, Adelphi, W.C. 2.

"Motor and Dynamo Control." By W. S. Ibbetson. Pp. xiii + 488; 178 illustrations. London: E. and F. N. Spon, Ltd. Price 21s. net.

"The Mining Electrical Engineer" (the *Journal* of the Association of Mining Electrical Engineers). Vol. I, No. 2, November, 1920 (36 pp.) 1s. net.—The second number of this very interesting journal contains a portrait and a brief sketch of the career of the President (Prof. W. M. Thornton, O.B.E., D.Sc., D.Eng.), with the presidential address; an article on "Coal Mining in the U.S.A.," by Mr. Winston L. Tulip, B.Sc.; "Underground Electric Lighting," by Mr. W. T. Anderson, M.I.E.E., and full accounts of the proceedings of the various branches.

N.Z. Tariff Revision.—Revision of the Customs tariffs is promised for next session. Mr. Massey has informed the Chambers of Commerce that the tariff he wants to see decided upon will be an extension of Imperial preference. He was prepared to negotiate for reciprocity with Australia, for which there was much scope; but he agreed with the Chambers of Commerce that there should not be any discrimination against Great Britain. This is the first indication of a policy for a revision of the tariffs, which is long overdue. It is 13 years since the last revision, when Imperial preference was first extensively applied.—*The Times.*

The Department of Overseas Trade.—The objects and work of the Department of Overseas Trade are admirably set forth in a recently-published booklet. Those who are not cognisant of the Department's activities in all parts of the world will find everything explained, while those who know and use the Department will require the book for the detailed information it contains. The *frontispiece* is a world-map showing where the Department's representatives are stationed, and it will be seen from this that at every centre of importance British interests are being watched over. Mr. Kellaway, M.P., Parliamentary Secretary of the Department, contributes an article on "The Need for Government Assistance to Commerce," in which he says:—"The more frequently British traders have recourse to the Department, the more useful it will be." The way in which the D.O.T. assists the British exporter is set out in detail, showing that the work is very heavy and consists of a great many parts. The organisation and the functions of officials, abroad and at headquarters, are described. Methods of distributing information, co-operation with the business community, and a number of other subjects are included in the handbook. In the appendices are given names and addresses of representatives and lists of special missions and investigations organised by the Department. Copies of the handbook may be obtained by United Kingdom merchants and manufacturers on application to the D.O.T., 35, Old Queen Street, S.W. 1, quoting reference No. 2092/TG.

Replacement-Value Insurance.—In order to meet the discrepancies, caused by the war period, between the present-day cost of replacing plant and materials destroyed by fire and the amount of compensation received on pre-war policies, it has been made possible to effect a policy of insurance to provide additional compensation. The F.B.I. *Bulletin* states that the Federation's Insurance Department will be pleased to assist any members who may be considering the advisability of effecting an insurance of this kind.

E.D.A. Activities.—In our last week's issue we referred to the "Electrical Xmas" campaign of the E.D.A.'s "opposite number" in the U.S.A. We have now received from the E.D.A. a 30 in. × 20 in. poster, depicting a shop window in which are displayed an electric fire, a kettle, an iron, and various other domestic appliances. Standing before the window are a man and a woman, and the latter (apparently) is saying, "Let's buy electrical presents this year!" An "insert" at the bottom of the poster announces that electrical appliances make ideal Christmas gifts.

For Sale.—By order of the Receiver (Mr. H. L. Farmer), Messrs. Leopold Farmer & Sons will sell by auction, on December 14th, at 72, Granville Road, Cricklewood Lane, N.W., the plant and machinery, stock, &c., of the Anti-Rust and Metal Deposition Co., Ltd.

The Disposal Board, Ministry of Munitions, is offering for sale by public tender a quantity of wireless apparatus and electrical cable, lying at Shepherd's Bush, Greenwich, and Birmingham. The Central Electric Supply Co., Ltd., is inviting offers for several reciprocating sets, turbo-generators, and condensing plants. For full particulars see our advertisement pages to-day.

Copper and Lead Prices.—Messrs. F. Smith & Co. report December 7th:—Copper (electrolytic) bars, £91, £2 increase; ditto. sheets, no change; ditto. rods, £107, £2 increase; ditto. H.C. wire, 1s. 1½d., ¼d. increase.

Messrs. James & Shakespeare report December 8th:—Copper bars (best selected), sheets and rods, £139, £3 increase. English pig lead, no change.

Forthcoming Exhibitions.—The following exhibitions are being organised:—

Cardiff.—January 26th-February 5th, 1921.—Health and Home Exhibition. (See Electrical Review, October 22nd.)

London.—January 5th and 6th, 1921.—Physical Society's Exhibition. (Electrical Review, November 5th.)

London.—February 10th to 26th, 1921.—"Efficiency" Exhibition at Olympia. (Electrical Review, June 25th.)

London, Glasgow and Birmingham.—February 21st to March 4th, 1921.—British Industries Fair. (Electrical Review, August 13th, September 24th, October 8th, November 12th and 26th.)

London.—March and October, 1921.—Society of Motor Manufacturers and Traders at Olympia.

London.—April, 1921.—Builders' Exhibition at Olympia.

London.—June 3rd to 17th, 1921.—Rubber Trades' Exhibition at Royal Agricultural Hall. (Electrical Review, April 9th.)

London.—September 7th to 28th, 1921.—Shipping, Engineering and Machinery Exhibition at Olympia. (Electrical Review, November 12th.)

London.—1923.—British Empire Exhibition. (Electrical Review, May 14th, June 11th, September 24th, and November 5th.)

South Africa.—March 9th to 16th, 1921.—Chemical, Metallurgical, and Mining Exhibition in Johannesburg.

British Dominions.—1921.—Dominions Touring Exhibition (South Africa, Australia, Canada, and New Zealand). (Electrical Review, March 26th and August 6th.)

Brussels.—April 4th to 20th, 1921.—International Commercial Fair.

Ghent.—April 16th to June 14th, 1921.—International Exhibition of Architecture, Building, and Kindred Industries. (Electrical Review, September 24th.)

Iceland.—June, 1921.—World's Fair.

Lima.—1921.—International Industrial Exhibition. (Electrical Review, November 12th.)

Peking.—1921.—International Exhibition. (Electrical Review, September 10th.)

Lyons.—March, 1921.—Metallurgy, Engineering, Building, &c., Fair.

Milan.—April, 1921.—International General Manufactures Fair.

Utrecht.—September, 1921.—International Fair.

Buenos Aires.—1922.—International Exhibition.

Rio de Janeiro.—1922.—International Centenary Exhibition.

Labour Exchanges.—The Committee of Inquiry that was appointed to investigate the outcry against the costliness and uselessness of labour exchanges and the demand for their abolition has issued a report. It states that the exchanges must be retained as a national system and a necessary corollary to the State system of unemployed insurance, but it is clear that they are capable of considerable improvement. The report admits that the exchanges have not displaced so far as was expected other methods of finding work and that they are not generally popular. They have not been fully used by and for highly skilled organised labour and the highest grades of unorganised labour. The Ministry of Labour is recommended immediately to overhaul the central and divisional offices with a view to curtailment, simplification, and economy. It is recommended that a National Section Board, with non-official members, should be set up to deal with appointments and that the departments now acting in respect of appointments and analogous matters arising out of the war should be absorbed with as little delay as possible in the employment exchange organisation. Sir Charles Sykes presents a separate report, in which he says that if it were not for unemployment insurance he would strongly recommend the immediate curtailment of the exchanges, and their restriction to unorganised workers. He points out that the Ministry of Labour estimates that the annual cost in a normal year is likely to be £2,200,000, and that 445,806 persons were found work during the first six months of 1920, so that the cost of the exchanges is over 49s. per vacancy filled. "The evidence given before the Committee appears to me sufficiently conclusive to condemn the system as it stands," adds Sir Charles, "as not having achieved the results intended, and being too costly." Much evidence against the exchanges was given to the Committee; Lord Askwith (late Chief Industrial Commissioner) thought the cost of the exchanges out of all proportion to their value.

Proposed B.T.H. Re-union.—It has been proposed that a re-union dinner for past and present B.T.H. draughtsmen be held in London on a Saturday in the near future. Those willing to support this proposal should write to Mr. J. H. Castell, Clun House, Surrey Street, Strand, W.C. 2.

International Chamber of Commerce.—In view of the important part which it may be expected to play in matters concerning overseas trade relations, and especially in its quality of providing representation for employers in the Councils of the League of Nations, the F.B.I. has decided to join the International Chamber of Commerce. Mr. Frank Moore attended the inaugural meeting of the International Chamber in Paris on June 23rd, and reported on the proceedings to the Federation. The question of membership was discussed on various occasions by the Overseas Committee, and a resolution of the Grand Council was published in *The Bulletin* of November 8th expressing sympathy with the objects of the International Chamber of Commerce and referring the question of F.B.I. support to the Executive and Finance Committees for consideration.—F.B.I. *Bulletin.*

LIGHTING AND POWER NOTES.

Australia.—VICTORIA.—A report is being considered by the Hampden Shire Council which recommends the abolition of the present generating plants at Terang and Camperdown, and the erection at Lake Gnotuk of one central generating station of the three-phase alternating type, with a 6,000-volt transmission system, designed to supply power, if necessary, to all the centres of population in the shire, as well as to country consumers along the transmission lines. The plant would be capable of extension, so as to serve such towns as Colac, Warrnambool, Mortlake, and Cobden, in neighbouring municipalities, would be in conformity with the standards now being adopted by the Electricity Commissioners in Victoria, and would be suitable for co-ordinating with any Government scheme of electric supply. The estimated cost of the scheme for Terang and Camperdown would be about £35,000, but it is considered that about £10,000 would be received from the sale of the existing plants.—*The Age* (Melbourne).

Barrow.—ELECTRICITY SCHEME.—It is reported that the Town Council recently had under discussion a big electricity scheme which involves the spending of close upon a half million of money. The scheme is being further considered, modifications and amendments of certain particulars having been decided upon. The full details will be announced in due course.

Barnstaple.—LOAN SANCTIONED.—The Town Council has received sanction to loans amounting to £9,700 for new plant, cables, &c.

Beachley.—SALE OF UNDERTAKING (?)—It is reported that the National Shipyards Board has sold the power house at Beachley to the West of England Joint Electrical Authority for £163,200, but as Joint Authorities have not yet the power to purchase undertakings, the report probably refers to an agreement to be carried out at a future date.

Bedford.—LOAN.—The Town Council has applied for a loan of £20,000 to cover excess expenditure on the electricity undertaking and various contracts in connection with extensions.

Belfast.—TEMPORARY STATION.—At the last monthly meeting of the Corporation it was announced that the temporary power station at Musgrave Channel had been opened and was giving an additional 4,500 KW., of which Messrs. Harland and Wolff's were getting 2,500 KW.

Bexhill.—PARLIAMENTARY BILL.—In the Parliamentary Bill to be promoted by the Corporation in the ensuing session, power is being sought to provide electrical fittings and to maintain offices and showrooms. Other clauses deal with sub-stations under streets, power to recover charges for reconnection, period of error in defective meters, discount on electrical supply accounts, and power to refuse to supply energy in certain cases. Objection was taken at a meeting of the Council to the clause relating to supply of fittings as competing with local tradesmen, but Alderman Bond urged that the Council should not be placed at a disadvantage with the gas company, and the proposals were approved.

Birmingham.—FINANCE PROBLEMS.—The question of the provision of capital for the further development of the Nechells permanent generating station has been deferred for a month, pending the result of further inquiries by the Finance Committee as to the prospect of raising the necessary loans. The Committee has in view the difficulty of securing Treasury assent to the flotation of stock.

HOUSE LIGHTING.—The Housing Committee has decided to install electric lighting in houses, erected under the Housing Scheme, which are in proximity to the main cables.

Blackburn.—EXTENSION OF SUPPLY.—Agreements have been made between Blackburn Corporation and Great Harwood and Rishton District Councils for the distribution of electricity to those townships. Application is to be made to the Electricity Commissioners for an order permitting Blackburn to supply electricity in bulk to Darwen Corporation.

Blackpool.—LOAN SANCTIONED, &C.—The Electricity Commissioners have sanctioned a loan for the purchase of two new boilers at an estimated cost of £42,250. To provide against any shortage of coal, the Committee have decided to install a system of oil firing. This will be auxiliary to the existing method, and will only be brought in in case of emergency. The Gretna Engineering Co.'s tender for the installation has been accepted.

British Columbia.—HYDRO-ELECTRIC SCHEME.—Details of an important scheme of hydro-electric development in British Columbia have been received from His Majesty's Trade Commissioners at Winnipeg and Montreal by the D.O.T. The Bridge River Power Co., Ltd., has the undertaking in hand, and it is proposed to utilise the power furnished by the Bridge River. This will necessitate a tunnel through the Mission Mountain, discharging on the shores of Seton Lake, which is about six miles from Lillooet. In that distance a fall of 1,240 ft. will be obtained, and the total estimated horse-power is 400,000. Every effort will be made to induce the development of big industries in British Columbia and from the limitless supplies of mineral, &c., to be found there, it is believed that a very prosperous future lies before the Province. Maps indicating the location of the power site and blue prints showing the general system of development are available, and these, together with reports on the proposed scheme by eminent Canadian engineers, may be seen by United Kingdom firms interested, on application to the Department of Overseas Trade, 35, Old Queen Street, Westminster, S.W. 1.

Canada.—EXPORT OF ENERGY.—Before leaving for England, Sir George Foster issued instructions that licences to export electrical energy from Canada should not be in excess of power actually exported. As a result, an Order in Council has been passed reducing the export licence of the Ontario Hydro-Electrical Commission from 45,000 to 40,000 KW., the Canadian Niagara Power Co. from 40,000 to 25,000 KW., and the Electrical Development Co. (Toronto Power Co.) from 25,000 to 15,000 KW. This does not reduce the power at present under export, but prevents the increasing of the quantity by any of these developing companies without cognisance of the Federal authorities.—*Reuter's Trade Service* (Ottawa).

PROPOSED NIAGARA DAM.—Dr. T. Lennard Thomson, consulting engineer, of New York, in an address to the civic club of the University of Toronto, speaking of power development schemes at Niagara Falls, advocated the construction of a dam across the Niagara River four miles below the falls, thus forming an entirely new waterfall, having a potential head of 100 ft., and capable of producing 2,000,000 H.P. This power, Dr. Thomson said, should be divided equally between the United States and Canada at a yearly rental to each country of $10 per H.P. produced.—*Reuter's Trade Service* (Toronto).

Cookham.—ELECTRIC LIGHTING CANVASS.—At a meeting of the residents last week, it was decided to have the district canvassed with a view to electricity being supplied by the Bourne End Electric Lighting Co., which requires a minimum of 2,000 points before proceeding with the work.

Continental.—FRANCE.—An extensive electric distribution network is about to be set up in the Department de l'Eure-et-Loir, affecting 70 communes in the Cantons of Illiers, Courville, Chartres-Nord and Chartres-Sud; 63 communes in the Cantons of Bonneval, Brou, Cloyes and Châteaudun; and 50 communes in the Canton of Auneau-Maintenon. Separate syndicates have been formed in each of the three groups of towns and communes named, who will work in common for the realisation of the general scheme, which purposes supplying the chief towns in the several communes and the important agricultural concerns. A supply of 5,000 KW. has been secured, and the network will be fed by three-phase, 50-cycle current at 30,000 volts and 15,000 volts, transformer posts being placed at the head of low-tension networks to serve the communes and hamlets. The building and working for 30 to 40 years of the several networks will be offered to private individuals or companies, whose tenders are invited. Proposals should be addressed for the first or Chartres group to M. Bouvart, president, 12, Rue du Quatorze-Juillet, Chartres; for the second group to M. Loura, president, 82, Rue de Chartres, Châteaudun; and for the third group to M. le Docteur Poupon, president, at Aunay-Sous-Auneau.

The utilisation of the tides for the generation of electricity seems to be progressing in France. One of the latest schemes is that for utilising the tides in the mouth of the Rance River, for which object a company, with a capital of 100,000,000 fr., has been formed. The project is not quite a recent one, having been mooted so far back as 1907, but the war caused the scheme to be laid aside. It was taken up again in 1910 by M. Parisot, then one of the directors of the Energie Electrique du Littoral Méditérranéen, whose efforts eventually led to the Minister of Public Works granting, in April last, a subsidy of 100,000 fr.

SPAIN.—A portion of the 25,000,000 pesetas, allotted in this year's Spanish Government's estimate for the improvement of the working of the Arrayanes lead mines belonging to the State, is to be devoted to electrifying the methods of working. Hauling, perforation and pumping are to be effected electrically; but while the energy will be supplied by the Compania Mengemor, when its works at the Carpis Falls are completed, a reserve the mic station will be set up in the mine itself.

The Sociedad Hidroeléctrica Ibérica has received authorisation to construct at Barcena de Pre de Concha, near Torrelavega, in the province of Santander, a dam 42 m. high, forming a reservoir of 9,000,000 cu. m., for the purpose of regulating the flow of the Torina stream in the dry season, and thus increasing the supply of hydro-electric power required for industrial purposes. Among the principal users of electric power in Torrelavega and its environs are the Solvay chemical concern and the zinc mines of the Royal Asturian Mining Co.—*Reuter's Trade Service* (Madrid).

Darlington.—ENGINEER'S BONUS.—A proposal made by the Electricity and Light Railway Committee to grant a commission to the borough electrical engineer on the reduction of working costs per unit sold below the average of the 40 lowest municipal undertakings, has been adopted by the Corporation.

Dewsbury.—PRICE INCREASE.—The Town Council is to advance the charges for electricity for power and heating to 120 per cent. above pre-war rates, except in the case of consumers supplied on the existing special rate system for heating only, in which case the charges will be increased by 133⅓ per cent. over pre-war rates.

Derby.—ADDITIONAL LOAN.—The Electricity Committee recommends that application be made to the Electricity Commissioners for sanction to borrow a further sum of £10,000 to cover the estimated additional cost of extensions.

Edinburgh.—Economy Necessary.—The Corporation electricity department has issued notices impressing upon the larger users of power the need for the exercise of economy, as the new plant, which was due to be installed some time ago, has not been completed. Measures of a temporary character have been adopted, with a view to coping with the situation with the least inconvenience to the consumers.

The electrical engineer reports that a 4,000-kw. turbo-alternator and three boilers are now in course of erection, but it will probably be a month or six weeks before these are ready for use. Meanwhile, existing plant is fully loaded.

Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing of £26,000 for the purchase of additional land adjoining the new Corporation power station at Portobello.

Electricity Districts.—Mersey and West Lancashire.—The Liverpool City Council has approved the draft scheme for the constitution of a joint electricity authority for the Mersey and West Lancashire electricity district. Application is to be made to the Ministry of Transport for power to acquire a site for a capital generating station, to erect the station, and to supply the main transmission lines necessary to link up the various electricity undertakings in the district. The joint authority will consist of 30 members—19 appointed by the local authorities supplying electricity, two by other local authorities not supplying electricity, one by the Mersey Docks and Harbour Board, four by companies supplying electricity, two by railway companies in the area using electricity, and three by large consumers. It was stated that Birkenhead wanted a scheme for a joint authority for Wirral, Southport wanted to become a separate district, but it was not anticipated those proposals would be entertained by the Electricity Commissioners, as the areas concerned were too small. Reference was made to the scheme at the Birkenhead Council, when the chairman of the Electricity Committee urged that alternative schemes should have the same sympathy of the Commissioners as the one before the public now. No preconceived ideas should interfere with the industrial and domestic needs of the Wirral peninsula, and Birkenhead in particular. He protested against other districts benefiting at the expense of the town, and urged that if they were to suffer for the benefit of other towns, they must oppose the present scheme, and put forward alternative plans. Bootle has relegated the scheme to a special meeting of the Town Council.

The Wallasey Corporation has lodged objections to the United Mersey Boroughs electricity scheme, as it has an alternative scheme of its own, by which it would become the main electricity supply for the whole of the Wirral peninsula. A Sub-Committee of the Corporation has suggested the formation of a scheme for the Birkenhead, Wallasey and Wirral district.

Lower Severn.—In pursuance of a notice issued by the Electricity Commissioners on April 30th, 1920, of the provisional determination by them of the above-named district (see Elec. Rev., May 21st, 1920, p. 646), the Commissioners give notice that they will hold a local inquiry in the new Council Chamber, Council House, Bristol, on January 11th, 1921, at 10.30 a.m., and following days, with reference to the area to be included in the proposed district, and the objections and representations which have been made on account of the inclusion in, or exclusion from, the said district of certain areas, and to consider a scheme which has been submitted for effecting an improvement of the existing organisation for the supply of electricity in the said district. Copies of the scheme, which provides for the formation of a Joint Electricity Authority for the district, may be obtained at a cost of 5s. each from Mr. H. Faraday Proctor, The Exchange, Corn Street, Bristol. Any body or person interested may attend the inquiry either personally or by counsel, solicitor, or agent. Any representations or objections with regard to the said scheme should be addressed to the secretary, Electricity Commission, Gwydyr House, Whitehall, London, S.W. 1, not later than January 4th, 1921, and a copy of such representations or objections should at the same time be sent to Mr. H. Faraday Proctor at his above address.

Elland.—Loan Sanctioned.—The District Council has secured approval to the borrowing of £19 300 for the new electricity undertaking. The sum comprises £500 for land; buildings, £2,700; E.H.T. mains, £3,000; sub-station, plant and crane, £9,100; prospective expenditure on mains and services, £2,900; and meters, £1,100. The original application was for £20,000, but the Commissioners have cut down the allowance for buildings to 80 per cent. of that asked for, though they are prepared to consider a further application, if necessary, when the actual cost has been ascertained.

Inverness.—Water-Power Schemes.—At a meeting of the Finance Committee of Inverness-shire County Council, on Friday, it was agreed to oppose the Highland water-power scheme, which was stated to be for the benefit of Perth and Dundee only. As regards the water scheme promulgated by the British Aluminium Co. for Lochaber, the Lochaber district where water is to be got, is satisfied except as regards one or two details. It was agreed also to oppose this scheme *pro forma*.

Keighley.—Extension of Supply.—The Electricity Committee has secured approval for the construction of a transmission line, mainly overhead, from the nearest high-tension main in the town to Eastburn quarries, for a general supply of electricity to Steeton-with-Eastburn and Sutton, and also for boosting up the voltage on the trackless car wires, at an estimated cost of £3,000, subject to the firm of Dixon & Co. agreeing to take a supply of current at the quarries for not less than five years on suitable conditions.

Kirkcaldy.—Transfer Negotiations Suspended.—The Town Council has resolved to suspend temporarily further negotiations with the Fife Power Co., in respect of the transfer of the town's undertaking, and to instruct the Town Clerk to ascertain from the Fife Power Co. what bulk supply of current it is now in a position to give the Corporation, what supply it will be in a position to give in the near future, and on what conditions.

Liverpool.—Report on Tidal Power.—The Tramways and Electric Power and Lighting Committee has asked the city electrical engineer to report as to the utilisation of the tidal water of the River Mersey for the generation of electricity.

Lymm.—Protest Against Exclusion.—The Urban District Council has lodged a protest against the exclusion of the town from the Mersey and South-East Lancashire area.

North Wales.—Power from Government Factory.—The Chester City Council and a number of other local government bodies are making strong representations to the Secretary of State for War, urging that power be supplied to the district from the Queen's Ferry factory. It is stated that the only two electricity undertakings in the district, those of Chester and Wrexham, cannot be extended at present, and that the 7,000 h.p. available from the factory would more than cover the present unsatisfied demands for power.

New Power Station.—The North Wales Electric Power Co. has acquired a large tract of land at Trawsfynydd, where it is intended to construct a large lake for the purpose of generating electricity for the supply of electricity to a large area of North Wales. The power station will be located at Maenturog.

Newcastle-upon-Tyne.—Proposed Acquisition of Undertakings.—At a meeting of Newcastle-on-Tyne City Council on December 1st, Mr. J. W. Thwaites moved that it be an instruction to the Parliamentary Committee forthwith to take into consideration the question of the exercise by the Corporation of their rights to purchase the electric lighting undertakings in the city, and that a report thereon be presented to the Council. The leases of the companies expired in July, 1922, so that there was ample time to acquire a clear knowledge of the position, and the possibilities of the proposition. The proposal was agreed to. The local electrical undertakings are:—The Newcastle-upon-Tyne Electric Supply Co., Ltd., and the Newcastle and District Electric Lighting Co., Ltd.

Palestine.—Jerusalem.—The Zionist organisation announces that at the last meeting of the Municipality of Jerusalem a scheme for electrically lighting the city, drawn up by Mr. Horwitz, was approved, and is to be submitted to the High Commissioner for his ratification. The Municipality expects to float a loan of £31,000 for this purpose if the plan is ratified by the Administration.—*Reuter's Trade Service.*

Paisley.—Stoppage of Supply.—The electricity supply over a large area of Paisley was, on December 2nd put out of action by a serious water-pipe burst, the electricity sub-station at Dunn Square being flooded. Considerable damage was done.

Rathmines (Dublin).—Lighting Restrictions Relaxed.—The District Council has agreed that the restrictions on public electric lighting during the military curfew period shall be relaxed so as to admit of half light by leaving one lamp alight on each standard where there are two lamps.

Slaithwaite.—Supply from Huddersfield.—The Urban District Council has entered into an arrangement with the Huddersfield Corporation under which the latter will supply electricity to the township. The Corporation will now take steps to obtain powers authorising it to make the supply.

Southport.—Completion of Extensions.—The installation of the new plant which is being provided at the electricity works, at a cost of £132,000, is expected to be completed within the next fortnight. In connection with the work, which was commenced in May last, a delay of 12 months was caused through the prolonged moulders' strike last year. In the meantime, great difficulty has been experienced in maintaining the supply of electricity from the old plant. As a result of the new installation, it is expected, in some quarters, that a great reduction will be effected in the present charges for electricity.

St. Helens.—Loan.—The Town Council is to apply for a loan of £47,550 for electricity purposes.

Tasmania.—Loan.—The Tasmanian Government hopes to float a loan in London early in 1921 to raise £1,250,000 required for public works, including extensions of the country's hydro-electric power installations.—*Reuter.*

Wallasey.—Breakdowns.—Owing to the number of serious breakdowns which have occurred recently, a Committee has been appointed to investigate and report upon the condition of the plant. It is stated that most of the trouble experienced is due to turbine failures.

Worksop.—Bulk Supply.—A report was recently submitted to the Urban District Council showing that a saving of £20,000 could be effected by accepting the offer of a bulk supply of electricity from the Wigan Coal and Iron Co., instead of extending the electricity works to meet present demands. The report was adopted.

TRAMWAY AND RAILWAY NOTES.

Bradford.—Collision.—Two Corporation tramcars, travelling in the same direction in Manchester Road, collided during a dense fog. The windows of both cars were smashed, and a passenger, Mr. J. S. Stead, of Low Moor, was injured on his left shoulder, and also suffered from shock. He was able to be taken home after being medically attended to.

Colne.—Further Fare Increase.—The Town Council has decided that the order authorising an increase of 50 per cent. in tramway fares is not sufficient to meet the new conditions caused by the increases in wages and cost of materials since the application was first made, and recommends that an amended application, to be made to the Tramways Charges Advisory Committee, for 100 per cent. increase.

Continental.—Sweden.—Messrs. Erik von Friesen and Granholm, of the Swedish State Railway Administration, have just returned from a visit paid to the United States, in order to investigate railway working in that country. Mr. Friesen is reported to have stated as a result of his impressions that the general opinion in the United States was that electric railways had proved specially satisfactory, and the system was being extended to new lines. A general conversion of the railways, however, would probably not be undertaken, at least within a measurable period. In many places the price of electrical power was too dear, as water-power was not available everywhere. It was practicable to use steam turbo-generators where the density of the traffic was considerable, and it was necessary to increase the carrying capacity. Another factor which opposed the investment of large sums in electric railway undertakings was to be found in the circumstance that the rates were balanced by special regulations which prevented the railways from earning large profits, the percentage being about 5½.

In an article in the "Svenska Handelstidning" it is reported that the Railway Department have submitted a scheme for the electrification of the line from Stockholm to Gothenburg. It is proposed that the electric energy be directed to the various points along the line from the works at Trollhattan and Motola River in the form of single-phase current at 100,000 volts. A transfer system, used for this kind of current, will be conducted along the Stockholm-Gothenburg track from Huddinge to Olskroken (or, if possible, from Alvsjo to Savenas). An extension will be made to the works at Motala, and also a similar line from Lagmansholm to Trollhattan. Step-down transformer stations (transforming to 16,000 volts) will be constructed at 16 points along the line. Contact rails are also to be laid for every main and branch line, with the exception of a few tracks in Stockholm, Hallsberg and Gothenburg; and, where necessary, other stations where ordinary steam locomotives have still to be utilised for the purpose of linking up different lines. Low-power lines are to be laid, and in some cases altered.—*Financial Times.*

Italy.—Official sanction has been accorded to the scheme of the Società Ferrovia Alta Pistoiese for the construction of a narrow gauge electric railway from Prachia to San Marcello Pistoiese, 16 km. long, at an estimated cost of £,974,451 lire. The works are stated to require three years for completion.

Derby.—Penny Stages.—The reinstitution of penny fares for short distances is being urged by a number of members of the Town Council. It is thought that this will result in a considerably increased revenue.

Dundee.—Anticipated Deficit.—It is anticipated that, after making allowance for the cancellation of workmen's fares, there will be a deficit on the year's running of the cars of between £7,000 to £8,000.

Halifax.—Tramcars Overturned.—During the severe storm experienced on December 3rd two tramcars were blown over practically at the same place, at a loop line near Stocks Gate, on the Queensbury route. The place where the mishaps occurred is about 1,000 ft. above sea level, and very much exposed to the winds from the North-West moors. The first car was caught by the wind whilst standing on the loop. The driver, conductor, and four passengers managed to scramble out without more serious injury than shock and cuts from broken glass. The second car, which was empty, was also standing when blown over. Both cars lay clear of the track, but, under the circumstances, traffic on this exposed section was suspended after the second accident. On the Causeway Foot section of the Halifax tramways, the same night, the overhead wires were blown down, and traffic had to be suspended.

Morecambe.—Electric Traction Rejected.—The Town Council has rejected a resolution to apply to the Ministry of Transport for power to borrow money to install electric traction. It was decided to abolish the horse-tram system and run omnibuses during the winter months.

Lancashire.—Christmas Stoppage.—There is every evidence that there will be no trams running in Lancashire again this Christmas, as the Lancashire District Council of the United Workers' Union have given notice of their decision not to work on Christmas Day. This decision, however, does not include Liverpool.

London.—New "Underground" Stock—On December 8th representatives of the Press and others took part in a private inspection of a trial run in one of the new trains just completed for service on the London Electric Railway.

Central London Railway.—The Minister of Transport has extended the time until July, 1922, of the Central London Railway Act, 1914, for the completion of the enlargement of the tunnels.

Manchester.—Tramwaymen's Claim.—A mass meeting of Manchester tramway workers was held on December 5th, and a heated discussion lasting over four hours ended in a decision to appoint a deputation to wait on the executive of the Tramways and Vehicle Workers' Union with the object of obtaining permission to take local action to enforce the demand for an increase of £1 per week on the present rate of £3 17s. for drivers and £3 16s. for guards.—*Daily Telegraph.*

Mytholmroyd.—Collision.—On December 1st a Halifax Corporation tramcar, travelling between Mytholmroyd and Hebden Bridge, came into collision with a County Council steam wagon and suffered a good deal of damage in the way of smashed windows, &c. No personal injury was sustained.

Newcastle-on-Tyne.—Light Railway.—A scheme, the estimated cost of which is approximately £45,000, is engaging the joint attention of the Newcastle Tramways Committee and the Tyneside Tramways and Tramroads Co. The proposal is to construct a light railway through Gosforth Park to connect the city system with that of the Tyneside company. The Committee reports that, subject to the settlement of details, the company is favourably disposed to the proposal. One of the conditions suggested by the company, and which the Committee is inclined to approve, is that in the event of the company applying for powers to extend its system upon the Great North Road, the Corporation should, if asked, support it. The Committee has recommended the City Council to make the necessary application to the Light Railway Commissioners.

Reading.—The Minister of Transport has extended the time until July, 1922, of the Reading Corporation Act, 1914, for the completion of the tramways.

Rochdale.—Estimate Deferred.—The Tramways Committee has deferred until the next meeting consideration of an estimate submitted by the borough surveyor for relaying a double track in Bridge Street.

The Committee has also informed the United Vehicle Workers' Association that it cannot grant compensation to men who lost time through the coal strike.

Southend-on-Sea.—The Ministry of Transport has confirmed the Southend-on-Sea Light Railways (Extension) Order, 1920.

South Shields.—Extension Approved.—The Ministry of Transport has confirmed the Light Railway Order for the Corporation to establish a car service to Cleadon in connection with the proposed extension of the borough boundaries.

TELEGRAPH AND TELEPHONE NOTES.

France.—Telephonic communication between Paris, Rotterdam, The Hague, and Amsterdam was to be re-established on December 1st.

Germany.—Illegal Wireless Apparatus.—The case against Dr. Heinrich Stinnes, the brother of Herr Hugo Stinnes, the Westphalian coal magnate, and his son Hans Stinnes, was resumed in the British Summary Court at Cologne, on Nov. 29th. The case had been adjourned from November 19th, when Herr Stinnes was charged on three counts with having wireless apparatus in his house, thereby transgressing the ordinance of the Rhine and High Commission and the military agreement for the occupation of the Rhine, as endangering the safety of the British forces. The defendant pleaded that it was an experimental set used by his son without any malicious intention, and that there was no attempt to conceal the aerials. The presiding officer accepted this view, and fined each of the defendants 10,000 marks (£40 approximately). He added that had he been convinced of the existence of sinister motives a long term of imprisonment would have been inflicted.—*The Times.*

Italy.—Foreign Telegram Tax.—As a result of the inflated value of gold the supplementary tax on foreign telegrams will be increased to 250 per cent., as from December 3rd.

New Cables.—According to *Telegrafi e Telefoni*, the Italian Servizio del Telegrafi has in contemplation a scheme to lay a series of submarine cables in the peninsula between Genoa and Trieste, two of which have already been laid—namely, Rome to Genoa and Venice to Trieste. The remainder of the scheme comprises eight lines—viz., Fiumicino to Naples, 255 km.; Naples to Messina, 354 km.; Messina to Catania, 104 km.; Catania to Syracuse, 65 km.; Catania-Taranto-Bari, 720 km.; Bari to Ancona, 454 km.; Ancona to Venice, 252 km.; and Spezia to Genoa, 85 km.—or a total of 2,289 km. The cost of the scheme at present prices is estimated at—cables, 30,000,000 lire; and laying same, 300,000 lire. The scheme is motived by the wish to escape atmospheric and electrical inductive effects.

Telephones in Parliament.—"To cope with any unexpected happenings," a "strategic" network of telephones has been installed in the Houses of Parliament, says the *Evening News*. One of the instruments has been fitted up just outside the Bar of the House of Lords itself.

United States.—Cable Controversy.—The Supreme Court of the District of Columbia, on November 30th, heard arguments in support of the Western Union Cable Co.'s application for an injunction to restrain Mr. Daniels, Secretary of the Navy, from interfering with the construction of a telegraph cable between Miami (Florida) and Miami Beach. Mr. Daniels submitted an affidavit to the effect that it had always been the Government's policy to prevent the laying of any cable on the shores of the United States connecting it with a foreign country in which the cable company had a "monopoly of cable connections." Mr. Colby, Secretary of State, also submitted a statement.—*Reuter's Trade Service* (Washington).

Wireless Time Signals.—Wireless telegraph equipment is being installed at the Huddersfield tramway offices, to the design of the son of the tramway manager, with a view to picking up the Eiffel Tower (Paris) standard time messages. A governor clock has been fixed, and the tramway clock, which is recognised as the standard timekeeper in the district, will be checked each day by the Paris message. The wireless installation is to be made by members of the tramway staff, and is expected to be completed next week. Huddersfield is the first English municipality to take its official time direct from the Eiffel Tower.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Melbourne.—February 24th. Electricity Commissioners. Plant for the Morwell power scheme—25,000-12,500-kw. turbo-alternators, 600-kw. turbo-alternators, condensing plant, circulating pumps, transformers, and switchgear, copper cable, steel transmission towers, &c. (November 26th.)

Queensland. — January 26th, 1921. P.M.G.'s Department. Telephone apparatus and parts. Schedule 509. (See this issue.)

Sydney.—January 31st. Municipal Council. H.T. and L.T. cable (specification No. 628). Electric Lighting Department, Town Hall, Sydney.

Belgium. — Antwerp. — December 16th. Municipal Council. Armoured cable terminal and junction boxes, automatic cut-outs, &c., for use at the Antwerp Dock. The specification in French is available for loan to British firms on application to the Department of Overseas Trade, 35, Old Queen Street, E.C.

December 14th. Municipal authorities of Ougrée (Province of Liége). Establishment and equipment of a laboratory for the standardisation and verification of three-phase electricity meters.

Birmingham. — December 11th. Electricity Supply Department. Six months' supply of stores, including vulcanised wire and wiring sundries, carbon brushes, &c. Mr. E. J. Jennings, Secretary, 14, Dale End.

France.—December 17th. The French State Railway authorities. The supply and installation of the necessary plant, at the railway works at Batignolles, Sotteville, Rennes and Saintes, for the maintenance of train electric lighting installations. Particulars from the Service Electrique, 88, Rue de Rome, Paris.

Boulogne.—Supply and erection of six electric travelling cranes for the Nord quay of the Loubet basin. Chambre de Commerce de Boulogne-sur-Mer.

Leyton.—January 11th, 1921. Urban District Council. Electric wiring 142 houses on the Barclay estate. (See this issue.)

Littleborough.—December 20th. Urban District Council Electricity Department. — High-tension cables, roadwork, &c. (November 26th.)

New Zealand. — Napier. — January 17th. Borough Council. One 500-kw. electric generating set. Copies of the specifications and blue prints may be seen at the Department of Overseas Trade (Mr. Holloway) up to December 15th, after which date they will be available for loan to British firms in the provinces.

Wellington.—January 21st. Public Works Board. Steel pipes and fittings required for the Lake Coleridge electric power plant (completion of fourth pipe line). Copies of the specification may be seen at the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

February 11th, 1921. Public Works Tender Board. Steel pipe lines and fittings for the Mangahao electric power plant. Copies of the specification can be seen on application to the Department of Overseas Trade (Mr. Goad) up to December 20th, after which date they will be available for loan to firms in the provinces.

Pontypridd. — December 14th. Board of Guardians. Supply of electrical material. Mr. W. Speckett, Union Offices.

Portrush. — January 1st, 1921. Urban District Council Electricity Department. Gas plant, engines and dynamos, booster and balancer, switchboard accumulators, overhead and underground cables. (See this issue.)

Rhodesia. — Salisbury. — January 18th. Municipal Council. Electric generating plant, switchgear, cable and converters. Specification (£3 3s.) from the Council's Consulting Engineer, Royal Chambers, Johannesburg.

South Africa.—Johannesburg.—January 13th, 1921. Rand Water Board. Supply and erection of steam boiler, superheater, stoker, economisers, &c., steam turbo-driven centrifugal pumps, condenser, &c., for the Swart Kopjes pumping station. Copies of the specifications, &c., and forms of tender can be seen on application to the Machinery Section, Department of Overseas Trade, 35, Old Queen Street, S.W.

Southampton.—December 17th. Electricity Department. Steelwork for extensions to boiler house and extensions to boiler-house equipment, exclusive of boilers. (December 3rd.)

St. Helens.—December 11th. Electricity Department. One double-girder hand-operated overhead travelling crane. (December 3rd.)

Wallasey.—December 14th. Corporation Gas Department.—Four electrically-operated capstans. Mr. J. H. Crowther Gas Works, Limekiln Lane.

CLOSED.

Aberdeen.—The offer of Mr. A. McRobb of £480 for wiring of portions of Oldmill, other than the special hospital, has been accepted.

Birkenhead.—Town Council. Accepted :—

W. T. Henley's Telegraph Works Co., Ltd., high-tension mains, £8,833.
British Thomson-Houston Co., Ltd., high-tension rotary converting plant, £4,660.

Bury.—Town Council. Accepted :—

Extensions at Chamber Hall power station :—

Clarke, Chapman & Co., Ltd.—Boiler.
W. H. Allen, Sons & Co., Ltd.—Condenser.
Babcock & Wilcox—Stoker.
Davidson & Co.,Ltd.—Fan.

Dartford.—Urban District Council. Accepted :—

Pirelli's, Ltd.—Cables, 450 yds., £238 10s., and 470 yds., £203.
Johnson & Phillips, Ltd.—280 yds., £93.

Darwen.—Tramways Committee. Accepted :—

Harwood, Allanson & Co.—Erection of a tram shelter at the borough boundary.

Dundee.—Ponspond & McHardy have secured the contract for electric lighting of the Corporation houses (two sections), their offers being £687 and £794.

Liverpool.—Corporation. Accepted :—

Power Rectifiers, Ltd.—Supply of a mercury vapour rectifier for the Garston power station.

London. — L.C.C. Highways Committee. — New coal-conveying plant at Greenwich power station :—

Fraser & Chalmers	£64,378
Babcock & Wilcox	69,803
Do. Alternative	72,655
Do. Do.	76,674
Spencer & Co.	84,594

The Committee proposed to accept the lowest tender, viz., that submitted by Messrs. Fraser & Chalmers, Ltd, but the company were unwilling to enter into a contract without certain increases for labour and materials. The Committee accordingly decided to accept the company's tender for Section 3 of the work (conveyors) only on the basis of the adjustment of price claimed by them, *i.e.*, £27,765, plus £1,644 increase. Fresh tenders were invited for Sections 1 and 2, and, as a result, the undermentioned tenders were received :—

	Section 1. Two transporters and crane.		Section 2. Weighing machines.
Armstrongs & Main, Ltd.	£29,304	..	—
Sir Wm. Arrol & Co., Ltd.	30,836	..	£5,040
Mitchell Conveyor & Transporter Co., Ltd.	34,595	..	3,300
Fraser & Chalmers, Ltd.	33,660	..	3,250
Do. Alternative	—	..	2,925
Spencer & Co.	42,471	..	3,850

The lowest tender for Section 1 is not to the Council's specification The Committee has decided to accept the tender of Sir Wm. Arrol & Co., Ltd., for Section 1, and the alternative offer of Fraser & Chalmers, Ltd., amounting to £2,045, for Section 2. This will involve the transfer to Section 1 of Sir Wm. Arrol & Co.'s tender of the provision of certain material, estimated at £440, which was included in Section 2, and will increase the amount of this tender to £31,276. The tenders the Committee proposes to accept are subject to increase or decrease in accordance with variations in the cost of labour and material. The Committee recommends that it be authorised to accept the tenders on this basis.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, December 10th. At the Imperial College of Science, South Kensington, S.W. At 5 p.m. Ordinary meeting.

Technical Inspection Association.—Friday, December 10th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 7.30 p.m. Paper on "Some Features of Tensile Fractures," by Dr. G. H. Gulliver.

Birmingham Electric Club.—Saturday, December 11th. At the Grand Hotel, Colmore Row. At 7 p.m. Annual General Meeting.

Chief Technical Assistants' Association.—Saturday, December 11th. At Anderton's Hotel, Fleet Street, E.C. At 3 p.m. Paper on "Adjudication of Tenders for Turbo-Alternators," by Mr. J. R. J. Bowden.

Manchester Association of Engineers.—Saturday, December 11th. At the Memorial Hall, Albert Square. At 7 p.m. Paper on "Radiology applied to the Testing of Materials," by Mr. A. P. M. Fleming and Mr. J. R. Clarke.

Institution of Post Office Electrical Engineers (London Centre).—Monday, December 13th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 5.30 p.m. Lecture on "The Development of Wireless Telegraphy," by Mr. E. H. Shaughnessy.

Royal Society of Arts.—Monday, December 13th. At John Street, Adelphi. At 8 p.m. Cantor Lecture II., "Micro-Organisms and some of their Industrial Uses," by A. Chaston Chapman.

Illuminating Engineering Society.—Tuesday, December 14th. At the Royal Society of Arts, John St., Adelphi, W.C. General meeting.

Institute of Marine Engineers.—Tuesday, December 14th. At the Institute, the Minories, E. Paper on "Lubricating Arrangements for Internal Combustion Engines," by Mr. E. G. Warne.

National Association of Supervising Electricians.—Tuesday, December 14th. At St. Bride's Institute, Bride Lane, E.C. Paper on "Progress in Lighting," by Mr. W. E. Bush.

Chemical Society.—Thursday, December 16th. At the Institution of Mechanical Engineers, Storey's Gate, S.W. At 8 p.m. Lecture by Sir R. Robertson, K.B.E., F.R.S.

Institution of Electrical Engineers.—Thursday, December 16th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Discussion of Report on the Heating of Buried Cables.

Friday, December 17th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Special General Meeting.

Informal Meeting.—Monday, December 13th. At the Institute of Patent Agents, Staple Inn Buildings, W.C. At 7 p.m. Discussion on "Percentage and Accuracies, Meter Constants and Standards, and Nameplates," to be opened by Mr. W. J. Minton.

Wireless Section.—Wednesday, December 15th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Paper on "Range of Wireless Stations," by Capt. R. C. Trench, R.E.

Liverpool Sub-Centre.—Monday, December 13th. At the University, Liverpool. At 7 p.m. Papers on "The Distribution of Electricity," by Mr. W. B. Woodhouse, and on "Some Economic Aspects of E.H.T. Distribution by Underground Cables," by Mr. R. O. Kapp.

North-Eastern Centre.—Monday, December 13th. At the Armstrong College, Newcastle-on-Tyne. At 7.15 p.m. Discussion of Report on the Heating of Buried Cables, to be opened by Mr. E. B. Wedmore.

North-Midland Centre.—Tuesday, December 14th. At the Hotel Metropole, Leeds. At 7 p.m. Discussion of Report on the Heating of Buried Cables.

Scottish Centre.—Tuesday, December 14th. At 207, Bath Street, Glasgow. At 7.30 pm. Paper on "The Distribution of Electricity," by Mr. W. B. Woodhouse.

Scottish Centre (Students' Section).—Friday, December 10th. At the Royal Technical College, Glasgow. At 7.30 p.m. Paper on "Static Transformers," by Mr. R. Dickson.

South-Midland Centre.—Wednesday, December 15th. At the University, Birmingham, at 7 p.m. Ordinary meeting.

Electrical Trades Benevolent Institution.—Wednesday, December 15th. Annual Festival. At the Connaught Rooms. At 7.30 p.m.

Electrical Development Association.—Friday, December 17th. At the Hotel Cecil, Strand, W.C. At 1.15 p.m. Luncheon.

Institution of Mechanical Engineers.—Friday, December 17th. At the Institution, Storey's Gate. At 6 p.m. Paper on "Thermodynamic Cycles in relation to the Design and Future Development of Internal-combustion Motors," by Mr. W. J. Walker.

Junior Institution of Engineers.—Friday, December 17th. At the Royal United Services Institution, Whitehall, S.W. At 7.30 p.m. Presidential address, by the Right Hon. Lord Weir of Eastwood, on "Some Reflections on our Industrial Situation."

Edinburgh Electrical Society.—Friday, December 17th. At the Philosophical Institute. At 8 p.m. Electrical Questions and Answers.

NOTES.

New Alloy Secret.—Tests were carried out at Sheffield recently of a new high-speed cutting product, containing a secret alloy. It removed from a test bar over five times the weight of material that was cut away by a standard high speed steel tool containing a tungsten ingredient.—*Daily Mail.*

Coal-Cutting Machines.—A statement issued by the Scottish Coal-Cutting Machinemen's Association emphasises the need for improvements to minimise the risk of accidents and danger to health in connection with coal-cutting by machinery.

Mr. Glancey, the secretary, reports that in the Lochgelly Seam, Blairhall Colliery, Fife, a machineman had the alarming experience of seeing gas ignited by the picks of the coal-cutter on which he was employed striking the pavement or floor. Had there been a large volume of gas present an explosion would have occurred.

It is probable, states the report, that the Home Office will frame regulations prohibiting the use of coal-cutters in "gassy" seams. This will be a serious blow to Scottish mining, and will certainly reduce output, as there is hardly a coal mine in Scotland but what has its "gassy" sections. The employment of coal-cutters has greatly increased during the past few years. In 1911 6,910,646 tons of coal were cut, in 1919 the tonnage amounted to 10,379,495, while for 1920 it is expected that the output will be somewhere in the region of 15,000,000.

The Debt of Honour.—That the obligation of the country to those who fought for it is being but tardily met is made clear by the figures recently given in reply to a question in the House of Commons. *The Times* report states that Sir M. Barlow, Parliamentary Secretary, Ministry of Labour, replying to Mr. Mills, said:—"The total number of able-bodied ex-Service men in Great Britain registered as unemployed on November 12th, 1920, was 203,479. Including Ireland, the figure was 220,935. The total number of wholly disabled or partially disabled ex-Service men registered as unemployed in Great Britain on the same date was 15,384. Including Ireland the figure was 18,881. These figures all relate to men on the 'live' registers of the employment exchanges, but I realise that a margin must be added for men unemployed but not registered."

The Channel Tunnel.—The Commission appointed to consider the question of the development of commercial relations between Eastern and Western Europe recommends the construction of a Channel tunnel as soon as possible.

Lectures.—THE INSTITUTE OF COST AND WORKS ACCOUNTANTS.—The second of a series of lectures, arranged by this Institute, will be given on Wednesday, December 15th, at The Hall of the Institute of Chartered Patent Agents, Staple Inn Buildings, Holborn, W.C., at 7 p.m., by Mr. G. E. M. Johnson, on "Decimals and their Application to Costing." Admission is by ticket only, which may be obtained from the Secretary at the above address.

Northampton Polytechnic Conversazione.—On Friday, December 3rd, the annual prize distribution and conversazione were held at the Polytechnic, Clerkenwell. The presentation of prizes and certificates by Dr. Sydney Russell Wells, vice-Chancellor of the University of London, was preceded and followed by organ recitals by the Polytechnic organist, Mr. Seymour Dicker. All laboratories, workshops, &c., were thrown open to visitors, and the students demonstrated their machines and work to interested groups. Half-hour "lecturettes" were given by two or three speakers, and gymnastic and swimming displays by the students and instructors formed yet another attraction. On Saturday the programme was continued for the benefit of the students and their friends, and an added enjoyment was provided by the Polytechnic orchestra and choir, who rendered an excellent programme of music. The very fine organ was again heard, and altogether the function was a gratifying success.

Electric Tricycles.—*Motor Cycling* states that the Swiss postal authorities intend to make use, in the near future, of electric motor-tricycles. These machines will be used in Geneva and Berne in connection with postal work. Apparently speed and heavy carrying capacity are not aimed at, for the machines are only fitted with a small battery of accumulators, and the speed of which they will be capable is estimated at 15 M.P.H.

Mines Department.—The constitution of the new Mines Department was completed on December 6th, when the transfer to the Department of the powers and duties of the Home Office in relation to mines and quarries became effective. Under the new organisation the post of Controller of Coal Mines, held by Mr. A. R. Duncan, will be abolished, and the duties discharged by the Secretary for Mines, Mr. W. C. Bridgeman, M.P.

A New Bronze.—A new alloy of copper and aluminium has been invented and tested by the Aktiebolaget Skandinaviska Armaturfabriken. The name given to the new combination is "alcobronze"; it has the colour and lustre of gold, and it is said to be stronger, tougher and harder than any other bronze. It can be wrought, forged or rolled in any way without suffering deterioration, and it resists the influence of the air, acids, and salt water. *Reuter's Trade Service* (Stockholm).

Western Electric Co.'s Printing Telegraphs and Telephone Repeaters.—On Monday we had the pleasure of witnessing a demonstration of the latest models of the Western Electric Co.'s multiplex and "start-stop" printing telegraph systems, as well as their telephone repeaters for use on long-distance lines. These apparatus have been brought up to a remarkable pitch of efficiency. Particulars will appear in a later issue.

The Electrical Development Association's Luncheon.—On Friday, December 17th, after the general meeting of the Association, a luncheon will be held at the Hotel Cecil, at 1.15 p.m. Some influential and interesting visitors are expected, and in view of the important work already accomplished by this young but energetic Association, as well as the vast field of labour which lies before it in the future, the occasion will rank as a notable one in the record of the year's activities.

The Electrical Trades Benevolent Institution.—On Wednesday next the annual festival takes place at the Connaught Rooms. We trust that no rival attraction will be permitted to prevail over the merits of this admirable Institution, and that the guests will assemble deeply imbued with the spirit of Christmas, so that a record result may be achieved.

Trade with Hungary.—The *Board of Trade Journal* states that particulars regarding commercial travellers have been supplied by the British Commercial Commissioner at Budapest with a view to the assistance of business men visiting Hungary. These particulars may be obtained from the D.O.T., 35, Old Queen Street, S.W. 1.

The Severn Barrage.—Elsewhere we give some particulars of the plant which it is proposed to put down for the utilisation of the tidal power of the Severn; they are extremely interesting, the project being absolutely unique and possessing some remarkable features.

The low head available necessitates a low speed of revolution for the turbines, though the runners are only 10 ft. in diameter; moreover, the speed will vary with the varying head, apparently precluding the use of alternating current. The generators, therefore, are of the D.C. type, driven by gearing with a speed ratio of 7½ to 1, and the E.M.F. will be maintained constant by varying the field. As the pressure will be 525 volts, and the output of each machine 1,300 KW., the current will be 2,480 amperes, necessitating large commutators, numerous brushes and heavy copper leads to the rotary converters. The total output is estimated at 500,000 H.P., presumably at the turbine shafts, and allowing for losses in the dynamos and gearing, the electrical power will be about 336,000 KW., so that there will be no fewer than 258 generators and turbines, allowing for spares, let us say, 300. This is a figure which completely swamps the vistas of Willans sets with which we used to be familiar 20 years ago, if it does not, indeed, stagger the imagination. Whether the machines will be marshalled in one long row, or in serried ranks, we do not know, but in any case, the ground space covered will necessarily be enormous; each turbine will occupy at least 400 sq. ft., so that the minimum space required will be 120,000 sq. ft., or 2¾ acres.

The dynamos will presumably be mounted at a higher level, on a floor of equal area. Above them, we believe, will be the rotary converters; these are to be of "large capacity," by which we may perhaps understand 10,000 KW. each, in which case there will be 40 machines, each taking a direct current of 19,000 amperes. We leave the commutators and brushes to the imagination of our readers. The leads from dynamo to converter must be at least 20 sq. in. in cross section, or 40 sq. in. per set, and even then they will run hot. No doubt there will be room for the transformers on the same floor, and if we neglect such items as switchgear, which no doubt will be reduced to the minimum, the total floor space to be provided in the building will be 8½ acres, in three floors, which must carry enormous weights. The pressure being raised to 60,000 volts for transmission, the cross-section of copper will be correspondingly reduced, and we may estimate that to carry the three-phase current, overhead cables of an aggregate cross-section of 9 sq. in. will suffice. The distance to the pumping station being 10 miles, the total weight of copper in this connection alone will be over 800 tons. The transmission mains to feeding centres will, of course, be many times as heavy.

At the pumping station the sets are of 13,000 KW. each; a peak load of 1,000,000 H.P. is allowed for—say, 750,000 KW.—so that there will be motor-generators numbering about 60.

Thus the complete plant comprises: 300 turbines and generators aggregating 390,000 KW.; 40 rotary converters and transformers aggregating 400,000 KW.; 60 turbines and generators aggregating 750,000 KW; and 60 pumps of, say, 300,000 KW., the whole being practically equivalent to plant aggregating over 1½ million KW.

Truly these are extraordinary figures. They are largely guesswork, but they are based on the "unofficial" figures, and anyone who pleases can work out others for himself. That so vast an undertaking necessitates a correspondingly huge plant is not denied, but we are loath to believe that the use of commutating dynamos in comparatively small sizes and of rotary converters is unavoidable or the best solution to the admittedly difficult problem of generation.

Appointments Vacant.—Two engineering draughtsmen (£150 + war bonus), one ditto £100 + war bonus, for the Metropolitan Asylums Board (the appointments are temporary); two engineering appointments in the Works Department of the Loughborough College; lecturer in Electrical Engineering, for the Birmingham Municipal Technical College; shift engineer (£400 + 50 per cent.), for the electric power plant at Dar-es-Salaam; assistant electrical engineer, or power station foreman ($150 per month plus 15 per cent., Straits Settlements currency), for the Singapore Harbour Board; assistant engineer (£250) for the Musselburgh Tramways and Electricity Works; telegraph inspectors (£300 + 50 per cent.) for the Posts and Telegraph Department, Tanganyika Territory. See our advertisement pages to-day.

Service Notes.—The following revision of the minimum substantive rates of wages for workmen forming part of electrical generating staffs in dockyards and other naval establishments has been approved:—Weekly rate for hired men at "B" class stations, supervisors of drivers and dynamo attendants, 45s. 6d. to 47s. 10d. Warrant Electrician W. Beavis has been promoted to Commissioned Electrician from the 1st inst. The following officers of the Electric Lights Companies of the Lancashire Fortress Royal Engineers (Territorial Force) have been transferred to the Territorial Reserve of Officers, with the ranks and promotions given:—Capt. J. W. Shawe and Capt. H. C. Williams, A.M.I.C.E., to be majors; Capt. J. D. Russell, Lieut. S. Brassey-Edwards, A.M.I.C.E., Lieut. G. Summers, to be captains; Lieut. L. P. Carter, Lieut. R. G. Smith, Lieut. H. W. Stafford, to be lieutenants; Lieut. H. D. St. J. Lidiard, Lieut. S. W. Newman, and Lieut. A. D. Phillips, from the Ryde Electrical Engineers, to be lieutenants in the Territorial Reserve of Officers—all from the 27th ult. Lieut. H. S. Peet, from the London Electrical Engineers, to be lieutenant in the Territorial Reserve of Officers from the 2nd inst.

Educational.—McGill University Fund.—Including the grant of $1,000,000 from the Government of the Province of Quebec, and $1,000,000 from the Rockefeller Foundation, the McGill University centennial endowment fund has reached the total of $6,321,000 (approximately £1,580,000).—*The Times.*

Admiralty Electrical Scholarships.—It is officially announced that the regulations governing the award of the Admiralty scholarship in Electrical Engineering at the Royal Naval College at Greenwich are under the consideration of the Board. Until further notice, however a three years' electrical course will be granted to the successful scholar, but only the boy who obtains the highest number of marks in three years, instead of two years, as previously, will be awarded an electrical scholarship.—*The Times.*

Christiania Developments.—It is now assumed with tolerable certainty that the Christiania municipal authorities have abandoned the idea of erecting a new central station with steam-driven plant in favour of obtaining a further supply of energy from other sources. This assumption is based upon the fact that a committee proposal has just been placed before the Council recommending that the electricity department should be authorised to enter into contracts to purchase a supply gradually rising to 20,000 KW. in the course of a few years. It appears that three schemes are available for selection. The first is an offer of 22,000 KW. from the Norsk Hydro Co. at Rjukan, at a price which was formerly stated to be about 95 kroner per KW. per annum. The opinion then prevailed that the State should defray the cost of the transmission line from Rjukan to Kongsberg, and the local authorities the cost from the latter to Christiania; and 4,000 KW. would be allocated to the district of Buskerud and 2,000 KW. to Drammen. The second scheme would be to obtain power from the works at the Raanaas Falls, which would be able to spare 5,000 KW. for Christiania, and the third relates to the Tysse works, from which an offer of 100,000 KW. was made in 1918 at a price of 90 kr. per KW. In this connection further proposals have been made to the Christiania authorities by the A.S. Tyssefaldene, the company offering from 10,000 KW. in the first year to 50,000 KW. in the fifth year. The company states that a financial syndicate in London has given a binding offer to finance the new works, subject to the fulfilment of certain conditions.

INSTITUTION NOTES.

Junior Institution of Engineers.—The Right Hon. Lord Weir of Eastwood, P.C., D.L., LL.D., will deliver his presidential address at a meeting of the Institution, to be held at the Royal United Service Institution, Whitehall, on December 17th.

At a meeting, last week, of the North-Eastern Section, at Newcastle, a paper was read by Mr. W. N. Waggott on "Modern Sub-Station Design." The author pointed out the necessity for cheap electric power, and the bearing which the cost of sub-stations and sub-station plant had upon the economical distribution of power, emphasising the necessity for cheap fuel, large units, and the interconnection of small stations.

Institution of Electrical Engineers.—(Western Centre).—A meeting was held at the South Wales Institute, Cardiff, on Monday last, and was well attended. The chairman (Mr. A. J. Newman) announced that the Council's proposals in connection with increased subscriptions had been adopted by a large majority. The large audience gave Mr. W. B. Woodhouse a rousing reception on his rising to deliver his paper on "The Distribution of Electricity," the reading of which was followed with sustained interest, and was productive of a good discussion, to which the chairman, and Messrs. A. Nicholls Moore, J. W. Burr, A. Ellis, W. Nairn, W. A. Chamen, and Major David and Capt. Lindsay contributed.

Technical Inspection Association.—At the first meeting of the session to-night, a paper on 'Some Features of Tensile Fractures" will be read by Dr. G. H. Gulliver.

Glasgow and District Radio Club.—On November 10th, Mr. E. Snodgrass gave an interesting lecture on "The Theory and Care of Accumulators." The lecturer fully described the construction of the various types and explained the chemical action. On Nov 24th Dr. G. E. Allan delivered a lecture on "Sound," with special reference to analogies in wireless telegraphy.

Institution of Post Office Electrical Engineers.—A general meeting of the London Centre will take place at the Royal Society of Arts, at 5.30 p.m. on December 13th, when Mr. E. H. Shaughnessy will give a lecture on "The Development of Wireless Telegraphy."

Paisley Association of Electrical Engineers.—Under the auspices of the Association, Mr. W. Blair Smith, the Corporation electrical engineer, gave an illustrated description of the town's electrical undertaking to a large audience, on November 30th.

Institution of Civil Engineers.—There has recently been inaugurated at Birmingham the first Local Centre of the I.C.E.; previously only students' meetings were held in the provinces. Mr. John D. Watson, M.Inst.C.E., F.R.S.I., chief engineer to the Birmingham Drainage Board, has been elected first president, and at the inaugural meeting at the University he delivered an interesting address. Why the Institution, which was admittedly the parent, ever allowed her children, in the persons of the mechanical, electrical, mining, and other engineers, to hive off and form separate units under separate management, he could not understand, but the effect had been prejudicial to the profession as a whole. He did not mean that it was unwise to have separate societies dealing with specialised subjects, but those societies should form parts of one great whole, and be guided by the salient rules of the governing

body. In a voting paper issued to members recently, they were asked if they approved of the Institution obtaining statutory powers to prescribe the qualifications and to conduct examinations for admission to the profession of civil engineering; to keep a register of civil engineers, and to prevent persons not duly qualified from holding themselves out as members of that profession; 97 per cent. of the replies were in the affirmative. The time had come when the profession should be elevated to the status of the professions of medicine and law.

Illuminating Engineering Society.—The hon. secretary of the Society will present a report on progress during the vacation, and there will be some interesting exhibits illustrating new developments in lamps, lighting appliances, illumination-photometers, &c., at a meeting to be held at the Royal Society of Arts, on December 14th.

Faraday Society.—An ordinary scientific meeting will be held at Burlington House, Piccadilly, W.1, on December 13th, when Dr. A. E. Oxley will present a paper by Prof. E. D. Campbell (University of Michigan), and open a discussion on "A Force Field Dissociation Theory of Solution Applied to Some Properties of Steel." Mr. A. L. Norbury, M.Sc., will read a paper on "The Electrical Resistivity of Dilute Metallic Solutions." Mr. W. E. Hughes, B.A., will read a paper on "The Forms of Electro-Deposited Iron and the Effect of Acid upon its Structure—Part 1, Deposited from the Chloride Bath."

The annual general meeting will be held at 8 p.m. before the ordinary meeting.

The following nominations for officers and Council have been made:—President, Prof. Alfred W. Porter, F.R.S.; vice-presidents, W. R. Cooper, Prof. C. A. Desch, Dr. J. A. Harker, O.B.E., F.R.S., Emil Hatschek, Prof. T. M. Lowry, C.B.E., F.R.S., Dr. E. H. Rayner, Dr. G. Senter; treasurer, Robert L. Mond, F.R.S.E.; Council, Dr. A. A. Allmand, Dr. H. Borns, Prof. W. C. McC. Lewis, Harold Moore, O.B.E., Prof. J. R. Partington, C. C. Paterson, Prof. A. O. Rankine, Sir Robert Robertson, F.R.S., Sir T. Kirke Rose, Dr. W. Rosenhain.

The Royal Society.—At the meeting on November 18th, papers were read by Prof. O. W. Richardson on "The Emission of Electrons Under the Influence of Chemical Action," and by Dr. A. E. Oxley on "Magnetism and Atomic Structure."

Chelmsford Engineering Society.—On December 2nd, Mr. G. Bass read a long and interesting paper on Diesel engines, Mr. C. W. Cooper presiding. The paper detailed the history of Diesels from the experimental engine of Dr. Rudolf Diesel, produced in 1893, up to the highly-efficient engine of the present day. The discussion following was adjourned to December 16th.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the **Electrical Review** *posted as to their movements.*

Tunbridge Wells T.C. has increased the war bonus paid to the electrical engineer from 10 per cent. of his salary to 20 per cent, as from October 1st last.

St. Helens T.C. has increased the salary of the electrical engineer from £600 to £800 a year; and that of the tramways manager from £575 to £650, as from October 1st last.

Mr. J. W. Collin has been appointed chairman of the Birkenhead Electricity Committee in succession to Mr. D. J. Clarke, and Mr. W. H. Egan, deputy chairman.

Mr. J. R. Taylor, a well-known employé of the Liverpool Corporation, was last evening, November 23rd, presented with a case of cutlery by his colleagues and friends, on the occasion of his marriage with Miss Stirland, of Gateacre. Mr. Dickinson, chief engineer, made the presentation, and speeches were made by Messrs. Collins, Douglas, and several other members of the staff.

The secretary of the Department of Scientific and Industrial Research announces that Sir John F. C. Snell has been appointed to be a member of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

Dr. Graham Bell, the inventor of the telephone, was presented with the freedom of the city of Edinburgh on Tuesday last week.

Kirkcaldy Corporation has increased the salary of the tramways manager and electrical engineer from £575 to £675.

Darlington Corporation has adopted a resolution of the Electricity Committee to increase the salary of the borough electrical engineer, Mr. Lunn, by granting him a commission on the reduction in working costs per unit sold, below the average of the 40 lowest municipal undertakings.

Mr. N. C. Rowan, A.M.I.E.E., resident engineer of the Power station of the River Plate Electricity Co., Ltd., La Plata, Argentine Republic, sailed on November 22nd for England on six months' leave. He will be pleased to hear from any of his old colleagues at Bradford, Sheffield, or Middlesbrough. His address will be 91, St. Andrew's Road S., St. Annes-on-Sea, Lancashire.

Mr. F. Rice has resigned his appointment as engineer and manager of the Pontypool Electric Light & Power Co., Pontypool, Mon., and has accepted the position of outside representative with the Commercial Electrical Supplies Co., 8, Westgate Street, Cardiff.

Mr. S. Douglas Cox, who since the inception of the company some seven years ago, has been chief electrical engineer of the Dubilier Condenser Co., Ltd., makers of high-tension condensers, has now severed his connection with this company. All communications in future should be addressed to him at his London office, 22, Tavistock Street, Covent Garden, W.C. 2.

Obituary.—Sir W. de W. Abney.—The death occurred at Folkestone, on December 2nd, in his 78th year, of Sir William de W. Abney, F.R.S., a pioneer worker in the field of photographic science, and adviser to the science department of the Board of Education since 1903. Sir William was also president of the Physical Society, 1895-97; chairman of the Royal Society of Arts, 1903 to 1905; and was elected a vice-president of the Royal Institution in 1905.

Flight-Officer C. O. Rigden.—Flight-Officer Cecil Osborne Rigden, who was killed in Egypt whilst flying a mail aeroplane on November 29th, was, when called up for service in August, 1915, an articled pupil with Messrs. Martin's, electricians, of Dover. He obtained a commission in the Royal Flying Corps.

Mr. M. L. Vealey.—The death has occurred, suddenly, at the age of 63 years, of Mr. M. L. Vealey, who for 20 years carried on the electrical engineering business at Much Hadham (Herts.), now conducted by his son, Mr. H. L. Vealey.

Mr. Francis Ince.—The death of Mr. Francis Ince occurred on the 30th ult. at Jarvis Brook, Sussex. Mr. Ince was well known in city circles as a legal authority on shipping and commercial matters, and was for many years the senior partner in the firm of Ince, Colt & Co. He was also well known in matters connected with electric lighting and power, having been associated for many years with the late Earl of Crawford and Balcarres, the late Lord Wantage, and others. He was also chairman of the Electrical Standardising, Testing and Training Institution at Faraday House.

Wills.—The late Sir William Mather, chairman of Mather and Platt, left £405,840, net personalty £394,896.

Mr. J. Weir, father of Lord Weir, and member of the firm of J. & G. Weir, engineers, left estate valued at £684,596.

Mr. R. S. Bain, late managing director of the London Electric Supply Corporation, Ltd., left £70,624, net personalty £66,831.

NEW COMPANIES REGISTERED.

Halstead Electric Supply Co., Ltd. (171,527).—Registered November 19th. Capital, £12,000 in £1 shares. To carry on at Halstead and elsewhere in Essex the business of an electric supply company, to establish stations and works for the generation and supply of light, heat and motive power; and to adopt agreements (1) with C. C. Pudney, of Bury St. Edmunds, for the transfer of all his interest in an agreement between himself and the Halstead Urban District Council, and (2) with Crompton & Co., Ltd., of London and Chelmsford, for the construction of the necessary works. Minimum cash subscription, £8,000. The first directors are: R. E. Minter, Market Hill, Halstead, Essex; S. Moger, North Street, Halstead, Essex; C. C. Pudney, Guildhall Street, Halstead, Essex; H. H. Portuay, J.P., Bois Hall, Halstead. Secretary: R. Sargent. Solicitor: G. S. Morton, Halstead.

Kenneth H. Kerr, Ltd. (171,505).—Private company. Registered in Edinburgh November 23rd. Capital, £3,000 in £1 shares. To carry on the business of electrical engineers, manufacturers of electrical appliances, iron founders, mechanical engineers, manufacturers of agricultural implements and other machinery, &c. The first directors are: K. H. Kerr, "Beechmont," Barr Hill, Dalbeattie, Kircudbrightshire; Wm. Kerr, "Beechmont," Barr Hill, Dalbeattie, Kircudbrightshire; J. G. Abbott, 31, Vaughan Road, Wallasey, Cheshire. Solicitors: J. W. Whitelaw and Edgar, Royal Bank Buildings, Dumfries.

Francis Law, Ltd. (171,706).—Private company. Registered November 29th. Capital, £1,000 in £1 shares. To carry on the business of electrical engineers, dealers in electrical goods, motors, motor accessories, kinematograph appliances, &c. The permanent directors are: F. H. R. Law (chairman and managing director), 18, Grove Gardens, Leeds; A. English, 7, Ayresome Avenue, Leeds. Registered office: Tower Buildings, Cowpasture Road, Ilkley.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Watford Electric and Manufacturing Co., Ltd.—Mortgage dated November 16th, 1920, to secure £5,400, charged on certain land and buildings in Watford. Holder: J. S. Barton, 8, South Parade, Pensarn, Abergele, North Wales.

Halifax and Bermudas Cable Co., Ltd. (28,972).—Return dated September 30th, 1920. Capital, £50,000 in £5 shares; all shares taken up; £50,000 considered as paid; mortgages and charges, nil.

Traction Development, Ltd.—Satisfaction in full on July 2nd, 1920, of debenture dated November 10th, 1916, securing £2,000.

Watford Electric and Manufacturing Co., Ltd.—Satisfaction in full on November 15th, 1920, of mortgage dated October 2nd, 1918, securing £3,400 and further advances and interest.

R. Cranmer Brown, Ltd.—Mortgage dated November 14th, 1920, to secure all moneys due or to become due from company to London Joint City and Midland Bank, Ltd., charged on a warehouse in Wellington Street, Hull.

Bombay Electric Supply and Tramways Co., Ltd. (in liquidation).—Trust deed dated November 12th, 1920, supplemental to trust deed dated November 7th, 1905, securing all moneys owing for the time being on the security of the said trust deed charged on £533,000 deposited in the Tata Industrial Bank, Ltd. Trustees: Electrical and Industrial Investment Co., Ltd., 88, Kingsway, W.C., and Sir Edward C. K. Ollivant, K.C.I.E., 2, Westbourne Crescent, Lancaster Gate, W. Also trust deed of even date, supplemental to trust deed dated May 13th, 1909, to secure all moneys due owing for the time being on the security of the said trust deed charged on £134,300 deposited with Messrs. Glyn, Mills, Currie & Co. Trustees: Electrical and General Investment Co., Ltd., 1 and 2, Great Winchester Street, E.C.

Foster & Pullen, Ltd.—Satisfaction in full on November 18th, 1920, of first mortgage debenture dated May 8th, 1915, securing £500, notified. First mortgage debenture, dated November 18th, 1920, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital, also registered. Holder: G. Grange, 35, Undercliffe Lane, Bradford.

Ernest F. Moy, Ltd.—Particulars of £6,000 debentures authorised by resolutions of August 26th and November 19th, 1920; whole amount issued; charged on the company's undertaking and property, present and future, including uncalled capital.

Laminated Gears, Ltd.—Issue on November 23rd, 1920, of £600 debentures, part of a series.

Sutton-in-Ashfield Motor and Electrical Engineering Co., Ltd.—Second mortgage and charge on certain land and premises in Sutton-in-Ashfield, and the company's undertaking and property, present and future, including uncalled capital (subject to prior debenture) dated November 13th, 1920, to secure £11,000. Holder: B. Walton, senr., Stoney Street, Sutton-in-Ashfield, Notts.

R. Darbyshire, Ltd.—Mortgage dated November 13th, 1920, to secure all moneys due or to become due from company to Lancashire and Yorkshire Bank, Ltd., charged on 10, Upper Talbot Street, Blackpool.

C. A. Vandervell & Co., Ltd.—Satisfaction in full on November 21st, 1919, of eight mortgages dated December 31st, 1918, securing all moneys then due or to become due from company to bankers (notified November 29th, 1920).

CITY NOTES.

Eastern Telegraph Co., Ltd. Revenue for 1919, £4,059,062, ordinary expenses £1,123,551, expenditure relating to maintenance of cables, difference in exchange income and war taxes payable abroad, contribution to pension and superannuation funds, depreciation of investments, payments to staff, and other war expenses, £1,083,627. Balance, £1,851,883. Income tax and excess profits duty, debenture interest and preference dividends absorb £580,326, leaving £1,271,557, plus £44,524 brought forward. £500,000 has been placed to general reserve. Three dividends of 1½ per cent. each and a final dividend of 5½ per cent. have been paid on the ordinary stock, making 10 per cent., free of tax. £416,082 remains to be carried forward. The general reserve fund has been charged with £573,264 in respect of the new Porthcurnow-Gibraltar (No. 4) cable, partial renewal of main line cables and other special expenditure, and with £200,000 as a further provision on account of investment fluctuation, the result being a net reduction of the fund for the year of £273,264. Of the issue of 1,000,000 new ordinary shares of £1 each offered to the ordinary stock holders at par, 933,121 shares were taken up by them; the staff of the company was given the option of applying for the balance of 66,879 shares, and applications were received from them for over three times the number of shares available. Meeting, December 15th.

Western Telegraph Co., Ltd.—The report to June 30th, 1919, states that the revenue was £2,683,076 and the working expenses £939,933. After providing £32,747 for debenture stock interest and £687,992 for income tax, excess profits duty, and corporation tax, £1,022,403 remains, plus £37,803 brought forward. £450,000 has been placed to the general reserve, £145,000 to provision on account of investment fluctuations, £50,000 to maintenance ships' reserve fund, and £50,000 to land and buildings depreciation fund. Expenses of issue of new capital and interest on instalments paid on account of new issues amounted to £7,866. One dividend of 1½ per cent., two dividends of 2½ per cent., and a final dividend of 3½ per cent. have been paid, making 10 per cent., free of tax. Carried forward £149,409. The capital of the company has been increased from £2,500,000 to £3,500,000 by the creation of 100,000 shares of £10 each, in accordance with the terms agreed to by the shareholders.

First quarterly interim dividend of 5s. per share, free of income tax, for the year ending June 30th, 1921, being at the rate of 10 per cent. per annum.

Yorkshire (West Riding) Electric Tramways Co., Ltd.—Final dividend of 3 per cent., less tax, on the cumulative preference shares for half-year ending December 31st, 1920.

Cape Electric Tramways, Ltd.—Dividend of 5 per cent., less tax, payable on December 31st.

Castner-Kellner Alkali Co., Ltd.—Final dividend of 12 per cent., making 22 per cent. for the year ended September 30th.

New Issues.—*Hadfields, Ltd.*—According to the financial Press, £800,000 of the recent issue of £1,000,000 7½ per cent. first mortgage debenture bonds was applied for by the public, and the B.S.T. has offered to relieve the underwriters of their liability for the balance at the issue price, less underwriting commission on the amount taken over.

Drake & Gorham, Ltd., are issuing at par £50,000 10 per cent. seven-year notes repayable on December 1st, 1927. The notes will be registered notes, and will be issued in denominations of £5, £25, £100, £500, £1,000. The company has no debenture debt outstanding, but has a loan of £12,000 on the basis of its head office and adjacent premises. The company undertakes that so long as any of the notes are outstanding no debentures or charges on any of its assets (other than the mortgage for the loan mentioned above) will, without the sanction in writing of a majority in value of the noteholders, be created except to secure bankers' overdrafts in the ordinary course of business. The directors and their friends, together with the staff and employés, have agreed to take £20,000 of the above issue. The funds provided by the present issue are required in order to place the company in a position to take full advantage of the present expansion of its general trade, and to handle agencies which have been taken up, or are on offer, for commercial electric vehicles, generating sets, &c. The lists close December 16th.

P. & W. Maclellan.—According to the *Financial Times*, the recent issue of 60,000 ordinary shares of £1 each has been over-subscribed.

Eastern Extension, Australasia & China Telegraph Co., Ltd.—Revenue for the year 1919 £2,446,865, ordinary expenses £605,990, maintenance of cable and special expenditure £355,790. Balance £1,485,044. Income tax and excess profits duty absorbed £413,865, and interest on the mortgage debenture stock £30,036, leaving a balance of £1,041,123, plus £41,347 brought forward. £350,000 has been placed to general reserve, £200,000 towards investment fluctuations, making the total provision against depreciation £450,000. Three dividends of 1½ per cent., and a final dividend of 5½ per cent. have been paid, amounting to £300,000, making a total of 10 per cent., free of tax. The above appropriations absorbed £850,000, leaving a balance of £232,440 to be carried forward. During the year, in accordance with authority, an issue of 100,000 new shares was offered to the shareholders at par and taken up by them to the extent of 90,629 shares, leaving a balance of 9,371 shares, of which 2,165 represent the fractional shares still to be disposed of by the directors for the benefit of those shareholders entitled thereto. The remaining balance of 7,206 shares was allotted to the staffs of the Eastern Extension and Eastern Telegraph Co.'s at par. Meeting December 14th.

Ferranti, Ltd.—The net profit on trading for the year to June 30th, 1919, was £18,251, after charging interest on debenture stock, notes and loans, and making the usual allocation to depreciation reserve and provision for taxation, including excess profits duty. The net profit for the year to June 30th, 1920, after making similar provisions, was £36,622. Leasehold land and buildings, plant and machinery were valued in April, 1919, and the figures have been adopted as book value of these assets. In consequence £50,000 has been transferred from depreciation reserve to general reserve, increasing the latter to £72,000. The works are now fully engaged upon the manufacture of electrical meters, instruments, and transformers. A dividend of 6 per cent., less tax, on preference shares on account of arrears was paid November 25th, 1919; a further dividend is recommended of 12 per cent., less tax., being two years' arrears. Annual meeting in London to-day, December 10th.

British Mannesmann Tube Co.—The directors of Baldwins and the British Mannesmann Tube Co. respectively have entered into a provisional agreement for the purpose of effecting a fusion of interests on the basis of an exchange of shares. Shareholders of the British Mannesmann Tube Co. will be invited to exchange their £1 ordinary shares for shares of Baldwins in the ratio of two British Mannesmann Tube shares for one Baldwins ordinary and 11s. in Baldwins 5 per cent. cumulative "B" preference shares, tax free, up to 6s. British Mannesmann Tube shareholders will receive the final dividend on British Mannesmann Tube shares up to June 30th, 1920, the new shares of both classes of Baldwins to be issued in exchange to rank for dividend as from July 1st, 1920.

Companies to be Struck off.—The following are to be struck off the Register within three months unless cause is shown to the contrary:—

British Radium Corporation, Ltd.
Electric Wiring and Fittings Co., Ltd.
Radiumlamp, Ltd.

Burmah Electric Tramways & Lighting Co., Ltd.—Dividend of 14 per cent., less tax, on preference shares for the period ended November 30th, 1913. £15,000 is placed to reserve and depreciation, £500 to special reserve for depreciation of investments, and £388 is carried forward.

Fuller's United Electric Works, Ltd.—Owing to industrial depression the directors have considered it advisable to defer payment of interim dividend on preference shares.—*Financier.*

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange markets have got into smoother waters. The financial difficulties encountered by certain well-known houses are said to have been arranged without open admission of failure. The storm of selling in various parts of the Stock Exchange has blown itself out for the time being, and markets have become slightly more placid. This is not to say that any particular recovery in prices has occurred, but merely that the general sentiment is less nervous and apprehensive. Financial prophets are doing their best to make the blood curdle at the prospect of what next April's Budget will unfold, but the Stock Exchange is tired of sensations, and quiet markets will be the order of the day until the New Year has turned.

Criticism continues to attack the scheme for the Severn barrage, more particularly on the financial side, the difficulty of raising money in these present days being regarded as a barrier almost insurmountable by the practical company promoter. At the same time, the scheme is sufficiently alive to render its absence from the immediate scene a matter of temporary postponement, and it will probably be revived in concrete form later on. Meanwhile, the two Americas are keenly interested in an ambitious scheme formulated in respect of a hydro-electric company which it is proposed shall start in Brazil. An electric smelting plant and steel mill is to be built in the Province of San Paulo, and another enormous power scheme is projected in Bolivia. The idea apparently is to enable South America to deal with its mining industries on a much more extensive scale than is being done now, and United States financiers have the matter in hand.

The electricity supply market is unaffected by the suggestions of the Committee for Official Electricity Control. London Electrics are flat at 15s. Shares changed hands at this price early in the week. St. James's are ¼ down at 6¼, getting a little nearer to the stage at which they will pay 10 per cent. on the money. As a share that is likely to improve in value, Anglo-Argentine Tramways 5½ per cent. 1st preference make a reasonable selection to put amongst other investments, of this kind. At 3, the return is over 9¼ per cent. on the money, with dividends due in January and July, and the company is doing sufficiently well to make the shares worth classing as a sound investment. The company's 5 per cent. debenture stock can be bought, however, at about 57, offering a return of £8 12s. per cent. on the money, so that those who are attracted by the way in which the company is going ahead may reasonably prefer to sacrifice 10s. per cent. in the yield in order to get the better security which the debenture stock offers. The 5½ per cent. second preference stand at a trifle above the price of the firsts, the reason being that they carry five years' dividend in the present price, and being cumulative, they stand to receive the arrears sooner or later. But, of course, they are paying nothing at present. There is some talk in the Stock Exchange of the Americans endeavouring to make a market once more in London in their railroad and utility shares. At present the possibility of such a thing is barred by the rate of exchange. If any means could be found whereby the exchange were reducible to a more normal level, it is practically certain that a good many American issues would find their way here. The United States has its labour and financial troubles as well as this country, but the United States is 3,000 miles off, it has command of the greater part of the gold which before the war was held in Europe, and it is undeniable that distance does lend enchantment to the view in such mundane affairs as those of finance.

British Columbia Electric stocks are not quite so good as they were. Mexico Tramways Sixes are lower at 31¼, other Mexicans also remaining in the doldrums. There is no fresh news from the country, and the long periods of waiting between the scraps of intelligence which are vouchsafed (usually *via* Washington) tend to discourage holders of Mexican securities. Brazilian Tractions fell to 39 and rallied to 41.

Underground Electric Income Bonds have recovered the 3 points which they lost last week, and are now up to 66½. Six months ago the company declared a dividend of one per cent., and the dividend for the previous six months was 3 per cent. It is said in the market that this result should be improved upon in respect of the current six months, and little buying is required to move the price sharply. The £10 shares are 2¼, and the shilling shares remain at 5s. 6d. No further changes have taken place in the Underground stocks. National Omnibus shares at 10s. are 1/16 lower.

Globe Ordinary and Eastern Extensions have risen to 15½. Anglo-American deferred is lower at 15½, showing a drop of 10s. The cable group otherwise is quiet and uninteresting. Marconis rallied sharply after their previous drop, the price touching 2 11/16 (before reverting to 2 9/16) on the arrival of Mr. Godfrey Isaacs from the United States, and his statement that important arrangements have been entered into which should benefit the company. He spoke cheerfully of the way in which wireless is going ahead in America, and this will be consolatory to holders of the old American Marconi shares, now Radio Corporations. Having regard to the extraordinary delay which has arisen in connection with starting a market in Radio shares, the hope is expressed that Mr. Godfrey Isaacs, while in the States, found time to arrange the mechanical difficulties which have barred the granting permission, by the London Stock Exchange Committee, to deal in the new Radio shares. The latter have been in cold storage, from the point of view of the holder, for some months or so, and many proprietors have grown restive at their inability either to sell or to add to their holdings.

Amongst the manufacturing shares, General Electrics are a little lower again at 24s. 4d., and Siemens eased off to 21s. 3d. The new shares are 20s. 3d., or 1s. 9d. below the price at which they were issued. Edisons keep dull at 15s., and Electric Constructions at 10s. 6d., nor is there any recovery from the fall which took place last week in Metropolitan-Vickers preference. Urban ordinary have dropped to 2s. 6d. and the preference to 17s. 6d. All the talk that there is at the present time of Excess Profits Duty being abolished, next Spring, fails to galvanise interest or even hopefulness in regard to industrials at the present time, because it is assumed that some substitute will have to be found for E.P.D., while the growing unemployment throughout the country tells its tale of the process of deflation which presses heavily upon the resiliency of commerce, not only in this country, but also in America. Armament shares are quiet. The English Electric Notes are expected to be left in the hands of underwriters to the tune of about 70 per cent., and a discount on the issue price is regarded as a foregone conclusion. The rubber market is a little better in spite of the continued heaviness of the raw material.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1918.	Dividend 1919.	Price Dec. 7, 1920.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	8	12	6	—	£10 0 0
Charing Cross Ordinary	4	7	8½	—	10 18 6
do. do. do. 4½ Pref.	4½	4½	2½	—	8 8 8
Chelsea	3	4	3½	—	6 8 0
City of London	8	10	1¼	—	8 17 10
do. do. 6 per cent. Pref.	6	6	17/6	—	6 17 2
County of London	7	8	7¼	—	10 13 4
do. do. 6 per cent. Pref.	6	6	8¾	—	7 7 8
Kensington Ordinary	6	7	3½	—	9 0 6
London Electric	Nil	2½	¾	— ½	10 0 0
do. do. 6 per cent. Pref.	6	6	2½	— ½	10 18 2
Metropolitan	5	6	3½	—	10 8 8
do. 4½ per cent. Pref.	4½	4½	2½	—	8 0 0
St. James' and Pall Mall	10	12	6½	— ½	9 12 0
South London	5	6	3¾	—	9 12 0
South Metropolitan Pref.	7	7	16/9	—	8 12 8
Westminster Ordinary	8	10	4¾	—	10 13 1
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	76¼	—	7 16 10
do. Def.	33/6	1½	15½	— ½	9 10 6
Chile Telephone	8	6	5½	—	*5 9 1
Cuba Sub. Ord.	7	7	7	—	*10 0 0
Eastern Extension	8	10	12⅛	+ ⅛	*6 13 4
Eastern Tel. Ord.	8	10	15⅝	—	*6 11 4
Globe Tel. and T. Ord.	8	10	15½	— ½	*6 13 4
do. do. Pref.	6	6	8½	—	6 17 2
Great Northern Tel.	22	22	20½	—	10 14 8
Indo-European	13	10	30	—	8 6 8
Marconi	25	25	2⅝	+ 1/16	9 15 —
Oriental Telephone Ord.	10	11	2⅜	—	*4 18 4
United R. Plate Tel.	8	8	6	—	*6 13 4
West India and Panama	1/3	Nil	¼	—	Nil
Western Telegraph	8	10	15½	—	*5 13 4
Home Rails.					
Central London Ord. Assented	4	4	4⅝	—	9 4 0
Metropolitan	1	1½	20	—	6 5 0
do. District	Nil	Nil	17½	—	Nil
Underground Electric Ordinary	Nil	Nil	2½	— ½	Nil
do. do. "A"	Nil	Nil	5/8	—	Nil
do. do. Income	5	4	60½	+ 3½	—
Foreign Trams, &c.					
Anglo-Arg. Trams, First Pref.	Nil	5½	8	—	9 3 4
do. do. 2nd Pref.	Nil	Nil	2½	—	Nil
do. do. 5 Deb.	5	5	58½xd	—	8 17 0
Brazil Tractions	Nil	Nil	41	— 1	Nil
British Columbia Elec. Rly. Pfce.	5	5	18	— 1	8 13 4
do. do. Preferred	2½	5	86½	— 1	*6 4 0
do. do. Deferred	Nil	3	26½	— 1	*6 4 0
do. do. Deb.	4½	4½	76½	—	7 10 6
Mexico Trams 5 per cent. Bonds	Nil	Nil	43	—	Nil
do. 6 per cent. Bonds	Nil	Nil	31½	— 1	Nil
Mexican Light Common	Nil	Nil	16	—	Nil
do. Pref.	Nil	Nil	26½	—	Nil
do. 1st Bonds	Nil	Nil	66½	—	Nil
Manufacturing Companies.					
Babcock & Wilcox	15	15	9½	—	*6 13 4
British Aluminium Ord.	10	10	18/-	—	11 10 2
British Insulated Ord.	12½	15	15	—	9 4 8
Callenders	25	15	14xd	—	10 0 0
,, 6½ Pref.	6½	6½	18/9	—	6 18 8
Castner-Kellner	20	17	8	—	5 13 4
Crompton Ord.	10	10	17/6	—	11 8 6
Edison-Swan	10	10	15/-	—	13 6 8
do. do. 5 per cent. Deb.	5	5	74½	—	6 14 8
Electric Construction	10	10	16/3xd	—	11 9 6
Gen. Elec. Pref.	6½	6½	18/-	—	7 4 5
do. Ord.	10	10	1¼	— 1/16	*8 4 0
Henley	25	15	12	—	9 4 0
do. 4½ Pref.	4½	4½	8½	—	7 4 0
India-Rubber	10	10	1⅞	—	*8 8 0
Met.-Vickers Pref.	—	8	11½	—	8 16 6
Siemens Ord.	10	10	1⅛	— 1/16	*9 8 2
Telegraph Con.	20	20	21	—	*5 14 8

* Dividends paid free of Income Tax.

BRADFORD CORPORATION'S DOUBLE-DECK RAILLESS CAR.

A Novel Vehicle Capable of Running on Tramway or Railless Routes.

In February last Mr. R. H. Wilkinson, general manager of Bradford Corporation tramways, submitted to the City Tramway Committee a design for a railless car with an enclosed top deck. Subsequently application was made to the Ministry of Transport for permission to use a vehicle constructed in accordance with his design, and this was granted. The first car of the new type was recently completed at the Corporation's Thornbury works, and on November 3rd it underwent its trials very successfully.

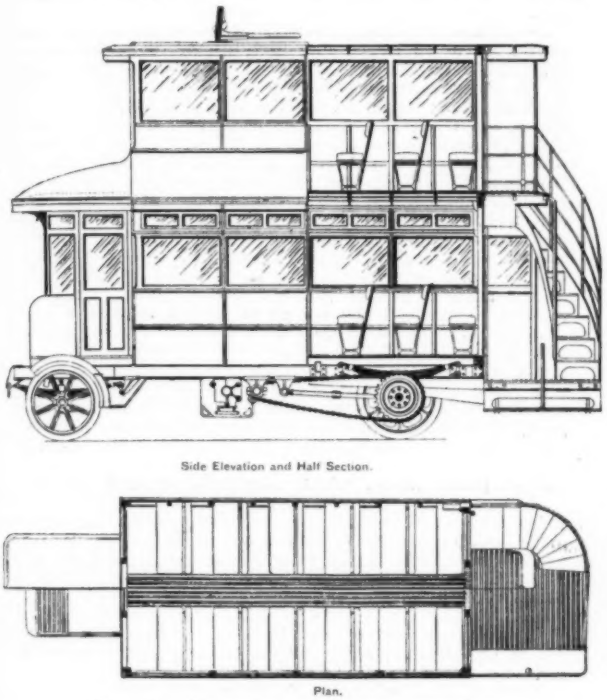


Fig. 1.—Sections and Plan of the Car.

The car, figs. 1 and 2, provides seating accommodation for 51 passengers, 26 being accommodated on the upper deck. It is driven by one 45-h.p. standard tramway motor mounted on the chassis frame and driving the back axle through a chain. Without load the car's weight is about seven tons; the extreme width of the car is 7 ft. 10 in., and its wheel base 13 ft. The sides taper toward the roof, which not only gives a good effect, but avoids the danger of collision when a sharp curve in the road would cause a wider roof to overhang. Rubber-tired wheels and well-sprung seats are provided, and the height of the car from the ground to the top of the trolley base is 16 ft. 5¾ in.

While intended primarily for railless routes, the car can be run from the ordinary tramway trolley wires along the tramway track. When this is done one of the two trolleys usually required for the railless system is fastened down, and the energy is collected by one trolley, contact with the permanent way being effected by fixing an iron shoe to the front of the car. The shoe, the patent rights of which are held by Mr. W. Cross, chief electrical engineer to the Rotherham Corporation, fits the groove of the rail and is connected by a short rod to the steering axle of the car; it thus serves to steer the car automatically and to provide the necessary earth contact.

Mr. Wilkinson informs us that in Bradford the working costs of single-deck railless cars are higher than they should be on account of the lightness of the car's structure consequent upon the weight restriction imposed; nevertheless they are approximately 4d. per mile less than those of the tramcars. With the new double-deck vehicle, which is the first of its kind to be used in this country, the working costs will be increased, and will become more nearly equal to those of the tramcar, but on the other hand, the capital expenses are very considerably less than obtains in the case of a tramcar, on account of the fact that rails are not required for the new type of vehicle; it might be pointed out that the cost of one mile of double line tramway track to-day would be at least £40,000. Mr. Wilkinson stated in June last that the railless vehicle would be the more economical up to approximately a five minutes' service on a single, and a three minutes' service on a double line tramway. Having constructed a double-deck covered top vehicle and actually got it into service, he is inclined to the opinion that it will prove itself to be the most economical form of traction vehicle for town service, under present conditions.

The capabilities of the present type of tramcar are limited on account of the narrow roads and the consequent delay caused by vehicular traffic; it cannot, therefore, be used to the best advantage. It is like using an ocean liner for river traffic. Given a certain minimum amount of traffic and an uninterrupted road to run upon, the tramcar would be able to prove itself the most economical vehicle on account of the high speeds it can attain. Stopping places, however, would require to be on the average not less than three-quarters of a mile apart, and short-distance traffic would have to be

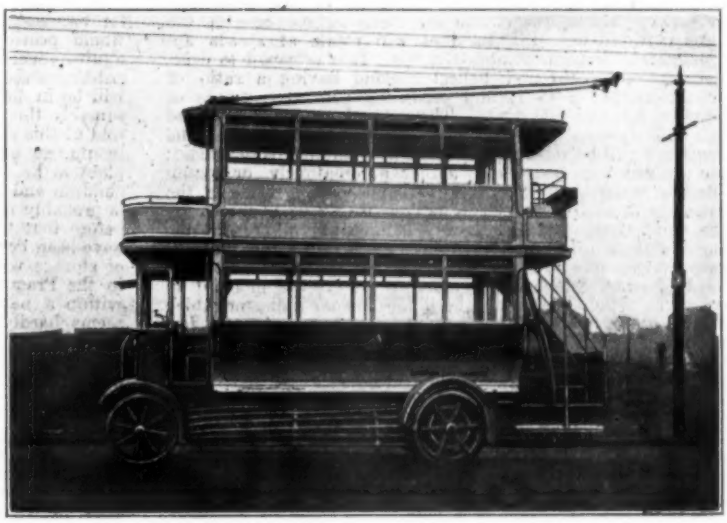


Fig. 2.—Bradford's Double-deck Railless Car.

catered for by some other type of vehicle. Before this could be done, however, a great increase in the width of the roadway would be necessary to provide ample room for other vehicular traffic.

Satisfactory as the new vehicle undoubtedly is, the designer can already see his way to introduce important improvements, which it is hoped to embody in the near future.

The new type of vehicle is not a competitor of the motor omnibus, the latter being the more economical where a service of about an hour or longer period is required. On all clear defined routes, however, where a closer service than one hour is necessary, the railless vehicle is the more economical, and its mechanism is much simpler.

Mr. Wilkinson points out that besides the relative economy of the railless cars, they possess certain advantages over tramways. One breaking down does not interfere with, or cause any delay to, other vehicles in service; they can draw up closer to the sidewalk for loading and unloading; they make considerably less noise than a tramcar, and offer greater facilities for inter-running arrangements.

Railless cars have been in regular service in Bradford and Leeds since early in 1911, but the new car differs largely from any that has hitherto been constructed. We are indebted for his co-operation in the preparation of this article to Mr. Wilkinson, who is to be congratulated on the courageous manner in which he has tackled a difficult problem.

THE PROPOSED SEVERN BARRAGE.

A 500,000-H.P. SCHEME.

WITH further reference to the above proposition, outlined in our last issue, inquiries at the Ministry of Transport elicit the following "unofficial" technical details of the scheme:—

At the Severn barrage the working period for the turbines will occur shortly after the ebb tide has commenced to run, and will continue throughout the hours of low water and until the tide has risen to about half its height. Owing to the fact that the ebb tide in the river Severn occupies a longer period than the flood tide, it is possible to obtain a working period for the turbines of approximately seven hours' duration, which is followed by a period of five hours' duration during which no power is obtainable. The head under which the turbines will work will be, to commence with, about 5 ft., and towards the middle of the seven-hour working period it will increase to a maximum (on spring tides) of 30 ft.

The type of turbine contemplated is the "mixed flow" one, the runners being 10 ft. in diameter, with vertical axes. The first difficulty which has to be overcome from an electrical point of view is that of adapting the electric generators to the varying speeds of the turbines. In the case of the Severn installation the turbines will rotate at speeds approximately between 40 and 80 R.P.M. It is proposed to drive the generators through helical gearing having a ratio of approximately 7½ to 1, and producing generator speeds of between 300 and 500 R.P.M. The type of generator proposed is a D.C. dynamo of special design with a vertical axis. The machines will be separately excited with shunt characteristic; the control will be effected either automatically, or by an operator controlling the excitation and load currents of the dynamos in such a way that the resisting torque offered by the dynamo will be such at any moment as to prevent the turbine from rotating at a speed greater than the theoretically correct speed for maximum output under the particular head of water which happens to prevail at the moment in question. The operator will be guided by an indicator which will show him exactly what head of water he has to deal with at every moment; the greatest rate of change of head which is anticipated will be 10 ft. increase, or diminution, in the hour. The dynamos will produce energy at the varying speeds at a constant pressure of 525 volts, the average output of each dynamo being approximately 1,300 KW. The direct current so produced will be fed to rotary converters of large capacity, which will produce alternating current at 330 volts; static transformers will next step-up from 330 to 60,000 volts, the pressure at which it is proposed to transmit the energy direct to industry from the tidal turbines. At such times, however, as the tidal-turbine installation is producing a greater amount of power than can be absorbed by industry, the residue of the power will be transmitted a distance of about 10 miles up to the storage reservoir where it will be made use of to drive motors which in turn will drive centrifugal pumps to force water up the 40-ft. diameter tunnel into the high-level lake. The motors which it is proposed to use will have a speed of about 375 R.P.M., working at 2,200 volts with an output of about 13,000 KW.; 90 per cent. of the motors will be induction A.C. machines, and the remaining 10 per cent. will be of the synchronous A.C. type. The induction motors will be cheaper and more easily paralleled; the purpose of the synchronous motors will be to keep up the power factor when they are acting as motors, and to supply wattless current to the induction machines when the whole are acting as generators. In order to save the cost of installing two sets of electrical machines at the storage reservoir it is proposed to combine in one machine the motor for driving the centrifugal pumps and the generator which is to be priven by a turbine when the storage reservoir is delivering power.

Whereas the amount of power to be derived from the tides in the Severn estuary averages, week in and week out, about 500,000 H.P. for a 10-hour day, it is proposed to install machinery at the storage reservoir to give a maximum, or peak output, of approximately 1,000,000 H.P.

As regards the distribution of the energy, four principal outlets are to be looked for; first, in the immediate neighbourhood of the Severn estuary, and created by the growth of industries requiring cheap power on the banks of the dockised river; secondly, in the industrial area of South Wales, the whole of which lies within a radius of 50 miles of the proposed Severn barrage. A third outlet for the energy will be found in the English Midlands; Birmingham is approximately 70 miles, and Stoke-on-Trent approximately 100 miles, distant from the proposed barrage. It is anticipated that there will be considerable difficulty in building steam super-power stations in the Midlands on account of the lack of available condensing water in that area. The fourth outlet for the power is in the Thames Valley and London; London is 115 miles from the proposed barrage, and it may be possible to transmit the energy at 120,000 volts in this instance. "The cost of a transmission line to London capable of conveying 500,000 KW. with a 10 per cent. loss in the line would be approximately one and a quarter millions sterling. The cost of the line and the transmission loss taken together would, therefore, only add a small fraction of a penny on to the cost of the B.O.T. unit delivered in London."

It is thought that the appropriate use for the electrical energy generated at the Severn barrage, having in view the storage power house, which is capable of producing peak load output at short notice, is to take up the peak load in industrial areas. That is to say, the Severn scheme can be made to work largely in conjunction with steam generating stations in such a way as to enable the latter to work with a load factor of from 70 to 80 per cent., instead of from 20 to 50 per cent. as at present.

The following views of Prof. F. Bacon, professor of engineering at Cardiff University College, on the scheme are of interest:—

One has to remember that the Severn is the thickest stream in the country. There is more matter per gallon in the Severn than in any other river, and the amount of silting trouble which might have to be faced due to a big obstruction of this kind would be a very serious matter. No mention has been made of the possibilities of erosion in the turbines, due to the presence of so much matter. The scheme differs from what I expected, mainly on account of the much greater power to be obtained, and the much greater expense involved in obtaining it. The system proposed seems to involve little risk of failure so far as its technical success is concerned, since it is planned on lines which have long been considered feasible for harnessing the tides, except that the capital expenditure would prove prohibitive. So far as I am aware, the only figures vouchsafed with regard to the economic aspect of the enterprise are in connection with the cost of generation, which will be in the neighbourhood of a halfpenny per unit. Presumably this supposes that the total power available is being sold at this rate. It will surely be many years before arrangements can be made to enable the maximum capacity of the plant to be sold for industrial purposes. If we think of our children and grandchildren rather than ourselves, the scheme is probably fully justified, though there is the possibility that before that time some cheap system of electrical storage may have been devised, which will mean that the hydraulic system of storage will have been money wasted. It has been stated in the Press that the costs have been correctly estimated to within a narrow margin of 5 per cent. either way, but it seems hardly credible that such precision in estimating the cost can be seriously claimed. No one can tell what difficulties may be encountered in the construction of the barrage, and the rate of remuneration of labour, representing such a vast proportion of the total expenditure, to be spread over many years, is surely largely an unknown quantity. A costly feature of the scheme is the way in which turbines and electrical machinery have to be duplicated. The huge turbines and generators to be located within the dam have to deal with a load of one million horse-power, but for the most part they are working very much smaller loads, and sometimes are shut down altogether. The load factors on the motors and pumps at the pumping station will be equally poor. The scheme is full of fascination, however, and I hope that prejudiced vested interests, &c., will not thwart its fulfilment if economic construction can show that it is certain to justify itself in the long run. Should the scheme be carried out, South Wales and district will reap the main share of the benefit, and it would seem to be a short-sighted policy that local opinion should be foremost in condemning the scheme.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

"Wireless" Reflectors.

Experience in shop-window lighting has demonstrated that the light should partake of the nature of a line rather than that of a sphere to obtain the best results, and that the reflecting surface should be as effective and unobtrusive as possible. In order to overcome the disadvantages which have hitherto attended the "light-line" method of illumination, Messrs. Huntalite, Ltd., 23, Newman Street, W., have designed "Wireless" reflectors. The distinctive features of this system are the use of straight filament double-ended lamps placed in front of continuous white porcelain reflecting surfaces; the elimination of all rubber-insulated flexible wires or exposed conductors; the whole fitting is non-combustible, and thus avoids all fire risks; small space is occupied, the porcelain reflectors being only 1¼ in. wide and 1¼ in. high; the arrangement of reflector and lamps provides an almost continuous line of filament; and simplicity in fixing. The complete fitting consists of any number of lamp-lengths together with one end piece and one circuit connector, while for special cases corner pieces and make-up lengths are also supplied. The device consists of a white porcelain trough (fig. 1), in the centre of which the double-terminal straight-line lamp (fig. 2) is placed. A screwhole is provided for securing the lamp length to its support. At one end the porcelain is shaped into a bridge, with a centre aperture parallel with the axis.

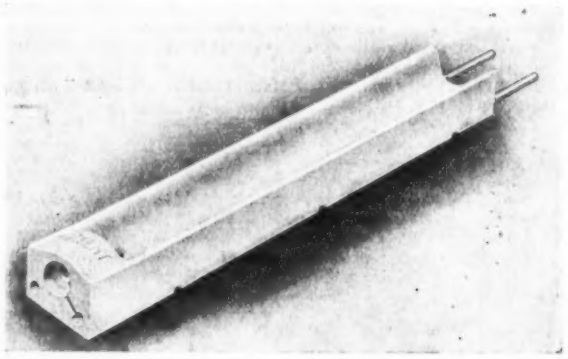


Fig. 1.—The "Wireless" Reflector.

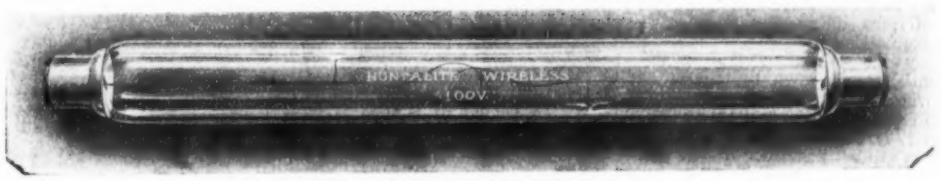


Fig. 2.—Double-ended Tubular Lamp.

Deep channels are cut from this aperture to the two holes leading to the grooves which run along the base of the porcelain trough. In these grooves, heavy brass rods (7 B.W.G.), forming the conductors, are placed. At the ends, one of these rods screws into the contact piece, which is wrought out of a solid piece of metal, and the other into a small sleeve. The centre contact is alternately connected in parallel to alternate conductors. At the end of the lamp run the end-piece connector, which is simply a porcelain bridge, forms the end contact for the lamp. At the other end the circuit-connector enables the connecting leads to be sweated in with a minimum of trouble. At the back of the porcelain the recesses in which the rods are run are filled in with cement, thus effectively insulating the rods. The porcelain base is slightly recessed to allow room for ventilation through small slots at the back.

British-made Fractional-H.P. Motors.

The increasing demand for labour-saving appliances throughout the world is stimulating inquiries for small fractional h.p. electric motors. In these circumstances it is in the national interest that British rather than foreign manufacturers should secure the business. Messrs. Scholey & Co., Ltd., of 56, Victoria Street, S.W. 1, have for some time past been developing the design and construction of such motors, which they began to manufacture for special work during the later period of the war. As we pointed out on the occasion of a recent visit to their works, they are now manufacturing motors for their electric drills and the "Premier" electric suction cleaner on a large commercial scale, and are extending the development of small fractional h.p. motors for every domestic and commercial use. Their aim is the construction of small motors with at least as great a reliability factor as larger motors, which generally receive some measure of skilled attention.

In general construction the Scholey fractional h.p. motors follow in miniature the lines of the best modern electrical practice. They are manufactured, moreover, in the interests of portability and price, to run at a very high speed, and, in addition, are capable of working off the comparatively high voltages obtaining on lighting circuits.

The armature cores are built up of thin laminations of high-grade electric alloy steel, carefully stamped and ground to size, and accurately balanced. The makers have succeeded in producing sound commutators which keep smooth and true up to the highest speeds, and great attention has been paid to the commutator connections to eliminate the danger of open circuits. High-speed graphite brushes only are employed. The armature laminations are assembled in position on the armature spindle by presses, which force them over a short tapered portion of the spindle on to the main seating, where they are held firmly in position. The armature spindle is hardened and ground, and runs in self-aligning radial ball bearings; an ample supply of grease is provided in a cup at both bearings, enabling the motor to run for long periods without attention. The motor case of the smaller types consists of an aluminium casting carried on a foot base of the same material, adapted for fastening to any convenient support. The motors are made in sizes from 1/50th h.p., of the series-wound "Universal" type; they have a high efficiency, are self-cooling, and will carry a heavy overload for short periods. Fig. 3 shows a "Scholey" motor applied to a kinematograph machine.

Fig. 3.—The "Scholey" Motor in Use.

"Leonard" Plug Gauges.

A renewable internal limit type of gauge has been designed to meet the demand for a limit gauge which can be supplied from stock in various sizes and limits required to suit general requirements. The gauge consists essentially of three parts, the "go" end, "not-go" end, and the handle, which may be either double or single ended as required. The handles are interchangeable, and one size will fit a range of plug sizes. The gauges are of steel hardened and ground to a limit of accuracy of within .0001 in. of the limit size. Used in conjunction with the adjustable limit snap gauges, they offer a most perfect system for gauging work.

The plugs are stocked to "Newall" Class "A" or "B" limits in sizes from ¼ in. to 3 in., in various steps. In these, and also in the renewable standard gauges, the plug portion can be replaced without scrapping the rest of the gauge.

Messrs. Alfred Herbert, Ltd., of Coventry, are acting as sole distributors for these gauges, which were brought out by Messrs. A. Leonard & Co., Croydon.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

PROPOSED SUBSCRIPTION INCREASE.

A SPECIAL general meeting of the corporate members of the Institution was held on December 2nd for the purpose of considering, and if thought fit, passing the subjoined resolution in the manner required by Section 69 of the Companies (Consolidation) Act, 1908. The resolution was to the effect: (*a*) That the following be substituted for Article 27 of the Articles of Association of the Institution: 27. Persons who have not compounded shall from January 1st, 1921, pay the following annual subscriptions: Members, £5 5s. (abroad, £4 5s.); associate members, £3 15s. (abroad, £3 5s.); associates, £4 5s. (abroad, £3 15s.); graduates, £2 10s. (abroad, £2 10s.); students, until the end of the calendar year in which the age of 21 is attained, £1 1s. (abroad, £1 1s.); students, after the calendar year in which the age of 21 is attained, £1 11s. 6d. (abroad, £1 11s. 6d.). (*b*) That the fourth paragraph of Article 33 beginning with the words "Members who . . ." and ending with the words "guineas" be amended by the substitution of the word "four" for the words "two and a half."

Mr. Ll. B. Atkinson, president, by the aid of lantern slides, outlined the situation in a very clear and precise manner. The budget for 1921 showed an estimated deficit of £5,425. In 1912, since when the scale of subscriptions had remained unaltered, the expenditure was £13,730, which with 6,600 members worked out at 41s. 6d. per member; in 1921 the estimated expenditure was £31,275, or with 8,400 members 74s. 6d. per member. It was thought that young men should not be discouraged from joining the Institution, and the Students' subscription rates should, therefore, remain unaltered. He dealt with some of the alternatives that had been suggested, showing that they would not meet the case; the ideal solution of the problem would possibly be the housing of all the scientific societies under one roof, but that, unfortunately, was not a practicable proposition at the present time. The requisite amount of money could not be raised, and a suitable building could not be built. He then explained that some of the criticisms which had been made against the proposed increase had arisen from a want of knowledge of the true state of affairs. All the facts could have been at the disposal of anyone who wished to apply for them; the proposed revision of subscription rates was foreshadowed in both the last two annual reports, and the hon. treasurer's statements of accounts, and also in the last two presidential addresses. Finally, he stated that it was an error to assume that the increase was necessitated by the prospective return of the Institution to its own building; the real governing factors were the general rise in prices and exceptionally enlarged activity of the Institution. The resolution was then put before the meeting by the president, and seconded by Mr. W. B. Esson. Two or three other members spoke in favour of the adoption of the resolution, pointing out that the real point at issue was not whether the increase was justified, but whether it would suffice.

Mr. F. W. Purse, who held proxy papers entitling him to exercise his vote on behalf of about 100 members, made a determined effort to oppose the resolution, and the majority of the other speakers were also hostile. Nearly all, however, apparently considered that some revision of the subscription rates was necessary. An attempt was made to defer the matter so that more time would be available for considering it, and it was urged that some concession should be made to country members who were not in a position to avail themselves of the full advantages offered by the Institution. Some thought that economies could be effected by, say, abolishing the annual dinner and the conversazione; on the other hand, other speakers emphasised the fact that the Institution could not afford to neglect its social side, and should entertain a certain number of visitors. The journal came in for a good deal of criticism. It was explained that very few members really wanted all the papers that were at present distributed to all, and some saving could be made by only sending those papers to members for which they asked. Further, could not the cost of printing the journal be reduced by accepting advertisements for publication in it?

Mr. W. R. Cooper held that the present state of affairs would not last, and prices were bound to fall. He, therefore, proposed that the resolution should be so worded that it could be reconsidered in two years' time and, if then found justified, the subscription rates could again be modified. Mr. Purse pressed his claim for an amendment of the resolution referring the whole matter back, which, however, was ruled out of order on legal grounds. He then substituted an amendment to the effect that the old subscription rates be increased by a flat rate of 10s. all round. Finally, the amendment was rejected, and the original resolution, amended on the lines suggested by Mr. Cooper, was carried by a large majority. A second special meeting of corporate members is to be held on the 17th inst. when the resolution will be submitted for confirmation.

A LARGE SWITCHBOARD.

WE were recently privileged to inspect a splendid example of a modern switchboard installation at the Carnaby Street works of the St. James's & Pall Mall Electric Light Co., Ltd. The work was commenced in 1914, but only one section had been completed when the war broke out, and MESSRS. ERNEST F. MOY, LTD., of Camden Town, who were executing the work, devoted their activities to the production of war material to the exclusion of their ordinary business. Mr. Ernest F. Moy kindly secured the permission of the St. James's Co. for us to visit the station for the purpose of examining the installation, which was eventually put into service some months after the armistice was concluded. The installation is in four sections: the main board; a battery and feeder board; a middle-wire board, and a regulating board. The main board controls the power from four motor-converters, two with an output of 1,000 KW. and two of 500 KW. each. The pressure is 220 volts between outers (3-wire system). From this board there are 12 feeders protected by a "shutter" type fuse on each pole. The total length of the main board and the battery-control board, which adjoins it, is about 70 ft., and the height from the floor of the engine room is 9 ft. The panels are of polished black slate mounted on a very substantial steel framework, and the whole of the constructional work and apparatus weighs nearly 49 tons. Among the chief features of the main board are two double-pole overload circuit breakers, designed to operate at 2,000 amp. These

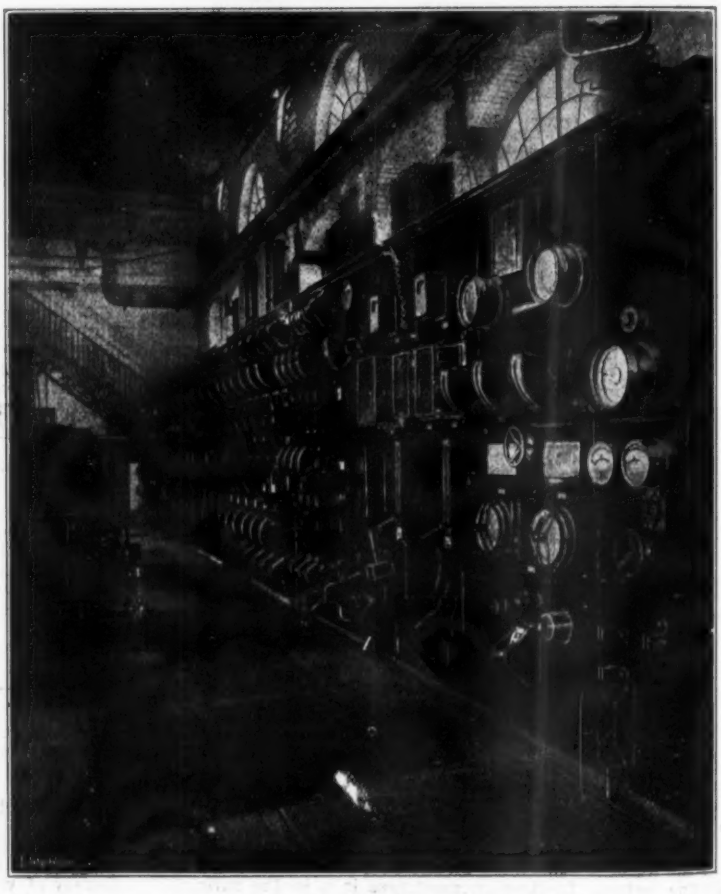


FIG. 1.—THE CARNABY STREET STATION SWITCHBOARD.

control interconnecting trunk mains linking up the Carnaby Street works with the company's Mason Yard sub-station. On another panel two double-pole busbar-coupling switches are mounted, constructed to carry a maximum current of 4,000 amp. These couple up the three sections into which the busbars are divided when the load is light and higher pressures are not required. The three sections of the busbars are designated "A," "B," and "C." The "A" section supplies the district in the immediate vicinity of the station, while "B" and "C" are generally kept at a higher potential to serve consumers in more remote districts. All the instruments, of which there is a great number, were manufactured by Messrs. Ernest F. Moy, Ltd., and are of the moving coil type. The construction of the busbars themselves

Fig. 2.—A Large Switchboard at Carnaby Street Station.

is of interest. They are built up of four sections of copper 6 in. wide and ¼ in. thick. Wherever it was found possible, all angles and connections were made by interleaving the sections and bolting them rigidly together. In this way ample air space is provided in the bars, which goes a long way to prevent overheating. Some idea of the amount of copper employed in the construction of the main board may be gained from the fact that the total weight of this item is about 12 tons. We must not omit to mention that one of the panels of the main board is devoted to interconnecting switches, &c., between the busbars and a board in No. 2 engine room, which was erected by Messrs. Moy 23 years ago. That the work was well done is substantiated by the fact that the board is still employed in the same position, controlling the output of two 500-kw. steam-driven generators. A notable feature of the installation is that the cables, instead of being brought up the back of the board to the various switches and other points, are, wherever possible, jointed to drop connections to the bars. Where it has been necessary to make higher connections the cables are connected to copper rods totally enclosed in red fibre tubes. All small wires, such as voltmeter and ammeter-shunt leads, are protected in drawn-brass tubes. In this way the risk of damage to the board by outbreaks of fire is reduced to a minimum. The part of the installation erected in 1914 was the battery and feeder board. This controls a large battery comprising 145 cells with a maximum discharge rate of 7,800 amp. for one minute, and a normal rate of 4,000 amp. for an hour. The charging and discharging indicating instruments are by Messrs. Ferranti, Ltd., and the recording wattmeters by the British Thomson-Houston Co., Ltd. This section is 20 ft. in length. The middle wire board is situated separately from the main and battery boards. The out-of-balance current is recorded on eleven separate connections by 16-in. circular scale meters, manufactured by Messrs. Moy, which facilitate the detection of faults in the middle wire. The balance of the system was being well maintained during our visit, the maximum out-of-balance current on any connection being only about 20 amp. The regulating board is situated in the centre of the switch room. The main features of this part of the installation are four double-pole, 28-way, pilot switches with connections to the various districts supplied by Carnaby Street; the usual recording voltmeters for each side of the system, and circular scale ammeters for the "B" and "C" busbar balancers. The board is substantially constructed, the frame being of hollow cast iron.

The illustrations (figs. 1 and 2) will give our readers some idea of the appearance of the board, which was designed throughout by Mr. Ernest F. Moy.

Trade with New Zealand Recovering.—According to *The Times'* Wellington (N.Z.) correspondent, the British share of the import trade of the Dominion is rapidly regaining its pre-war proportions. Last year there had been improvement, but importers experienced such difficulty in obtaining requirements that they were compelled to patronise America, Australia, and Japan. Orders came more freely this year, and the British share of the total import trade for the first three quarters is 47 per cent., against 41 per cent. last year. The American share fell from 26 to 17 per cent., and the Japanese from 4¼ to 2 per cent. The September quarter imports have quadrupled over last year's. Before the war Britain had 67 per cent. of New Zealand's competitive trade. At the present time that proportion is practically re-established, and with careful handling the market may be improved, as the war period did not enable other countries to establish a basis of permanent trade. Commenting on these figures the British Trade Commissioner, Mr. Dalton, expresses satisfaction at the proof of increased British competitive ability, despite the abnormal difficulties of reorganisation, and he emphasises the fact that British merchants are anxious to meet the needs of New Zealand.

THE DISTRIBUTION OF ELECTRICITY.

DISCUSSION AT MANCHESTER.

AT Manchester, Mr. W. B. Woodhouse's paper on the above subject, which was abstracted in our issue of December 3rd, was read and discussed before the North-Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS.

Mr. H. S. RATCLIFFE thought that the paper invited discussion in every paragraph. The reference to the time element in relation to capital and expenditure on development was an extremely desirable one in view of the fantastic schemes which were put forward from time to time. Judging from some of those schemes one would almost think that a 200-mile transmission line was regarded as a desirable adjunct to a generating station, whereas transmission " was not a virtue, but an expensive necessity " at the present time; a very expensive necessity. With regard to protective gear, at the moment they appeared to be approaching a state of development when they would require super-protective gear to protect the protective gear. He held that the interconnection of networks should be, as much as possible, through the medium of the extra-high-pressure transmission mains, and that the intermediate-pressure and low-pressure mains should be as far as possible isolated. He could not understand the author's remark to the effect that the cost of overhead lines was proportional to the pressure; it did not seem right from the figures which the speaker had gone into, but if it was so he was not sure what the saving was, except in the transmission losses, by adopting higher pressure. The effect of the load factor on the copper losses was not always quite appreciated as it should be; not only were they a peak load loss, but they also had a load factor which might be very appreciably lower than the load factor alone. A 16 per cent. difference had been cited, but he had known a very much larger difference than that. That was to say the cost incurred in generating energy which disappeared in those losses was very high, and they ought to be charged up at a figure quite as high as, or probably higher than, the maximum charge for energy. Further, since they were a peak load loss and had a load factor much lower than the load factor alone, they had the effect of reducing the equivalent total load factor, bringing the load down, and raising the generating cost all round. So they were the most expensive losses. The iron losses in transformers and dielectic losses in cables, which were practically constant within certain ilmits, could be put at rock bottom prices. His formula respecting the cost of load factor losses was: $f = F^{3/2}$, where f = load factor of losses, and F = load factor of the load. The author's suggestion that with the higher pressures the carrying capacity of the cables was reduced owing to the increased thickness of the dielectric might be true to a certain extent, but it was only a very small extent; the true reason for the reduced current density at the higher pressures was the very rapid increase in the dielectric losses which varied somewhat in the order of the square of the pressure. The temperature gradient in a cable was really made up of two gradients, the temperature gradient within and that outside the cable. By increasing the thickness of the dielectric the overall dimensions of the cable were increased, improving the radiating or conducting properties, but the sum total effect was very small indeed. It was possible, in certain circumstances, by putting more dielectric upon the cable, to reduce the temperature of the conductor; the dielectric loss caused the increase in those cases without a doubt. Concerning the current-carrying capacity of cables, where 33,000-volt, 3-phase, paper-insulated cable was used: $I = \sqrt{a}\,D$, where a = sectional area of conductor per phase in sq. in. and D = diameter over the lead covering in inches. The dielectric losses were not only proportional to the capacity and voltage, but unfortunately also proportional to the temperature of the cable and to the power factor of the dielectric regarded as capacity. That power factor, unfortunately, was at times very high, dependent upon the characteristics of the cable; it might rise very rapidly with temperature, or comparatively slowly. What they wanted for high-pressure work was a cable in which the power factor only varied slowly with increases of temperature. That had a very special value, and cables of that description were now obtainable. There were always two sides to a question, and dielectric losses had their advantages. There was no obvious reason why the dielectric loss should increase with the square of the pressure; it would increase at a rather lower rate, but so far he had not been able to get the cable makers to accept that opinion.

Mr. S. J. WATSON pointed out that the author rightly differentiated between the value of the losses where the generation was by means of water power and where it was by means of steam plant. Once the water power plant was established the losses, either in generation or in transmission, were substantially negligible; in fact, they did not cost anything at all whereas in the case of steam plant one had to purchase coal in order to meet those losses. There was a very real difference between the two methods which sometimes was not fully appreciated. With regard to the supply of power at a distance to large communities in dense areas, particulars which the speaker had collected showed that the ultimate requirements for industrial purposes amounted to something of the order of ½ H.P. per inhabitant, and in a larger Manchester with a million inhabitants the ultimate demand was bound to reach, and possibly exceed that figure. That was a somewhat rough and ready rule, but none the less it gave results which were approximately correct. He thought it was certain that they could not generate at a great distance from a load centre, and he could not see the slightest possibility of a 50,000-K.V.A. cable being brought into commercial use; 20,000 KW., or even half that amount, was quite sufficient to use by reason of the tremendous inconvenience and loss it would occasion. On those grounds it was exceedingly improbable that 10,000 or 20,000 would ever be exceeded. To some extent he agreed that higher pressures would probably be adopted, but they could not overlook the fact that if they had one pressure, say, 10,000 volts or upwards, a second pressure of 2,000 volts, and a third of 400 volts, they might in certain cases appreciably increase the losses in effecting transformation. Where a second pressure was adopted it would have to be used entirely in the form of the intermediate pressure, say, 2,000 volts, for fairly large motors in industrial works. They must pay the greatest possible attention to losses; they were out to give the cheapest possible supply, and any additional transformation must mean some loss, and, therefore, the prices must be sufficiently high to reimburse them. Interconnection between power stations was of practical importance at the present time, and he entirely agreed with Mr. Ratcliffe's remarks that it was only the main transmission line which should be interconnected with the second network. The production costs wanted dividing at least into three. There were the costs at the power station with a certain load factor; then the main transmission lines, which might have quite a different diversity load factor; and lastly the distributing work, which again might have quite a different load factor to the main transmission line and to the power station. In order to properly cost out the charge per unit delivered to the consumers it was essential to separate the power station, main transmission, and the distributing costs. Main transmission lines must have no tappings; they must run straight through from station to station so that there be no intermediate tappings, weak spots, or gear which was likely to cause trouble in operation. Overhead lines would continue to be extremely useful as secondary lines, but they were not sufficiently safe, *i.e.*, they were subject to interruptions which a well-made underground cable was not subject to. The main transmission lines and the main interconnecting lines should not be constructed on overhead lines, but for secondary purposes they might still be used to the extent which they deserved.

Mr. W. B. WOODHOUSE, in his reply, stated that he had included in the cost of the underground cable the cost of the pilot wire, but not so in the case of the overhead line. He had hoped in that particular district to have heard more from the cable makers. He had rather stressed the idea of using cables for the transmission lines because they all knew the advantages and disadvantages of overhead lines; all the big transmission systems in the world were on overhead lines, and he wanted to explain the possibilities, in this country at all events, of putting transmission cables underground. Difficulties of wayleaves were quite considerable, and the difficulties of getting away from the station were almost as great as those of getting the heat away from the cable, but he thoroughly agreed with Mr. Watson that the use of overhead lines for general power distribution would increase enormously. As time went on weaknesses were eliminated, and they were steadily developing a construction that was quite dependable for distribution. There was no doubt from experience in other countries that one got a very fair degree of reliability for transmission, but always subject to weather conditions, and it was just a question whether they could afford to make a town, such as Manchester, for example, dependent for its activities on whether a thunderstorm occurred or not. The proposal that the Government should lend the industry money free of interest for an unlimited number of years would be disastrous. It was a very rapidly growing industry, and he was sure that if they followed the old sound commercial principle of proving each step and seeing that they could make it pay, in the long run they would be better off. When speaking of the variation of the cost of an overhead line with the pressure, he meant on any particular cross-section; of course it increased with the pressure, but not as rapidly as the square of the pressure. With regard to dielectric losses, they were very much at the mercy of the temperature, and they wanted a great deal more information. There seemed a prospect of getting high-pressure cables for something like 40,000, 50,000, or 60,000 volts, with a low loss at low temperatures; they had, therefore, to see that they did not overheat those cables, and that the dielectric losses did not run up to a dangerous figure. A ½ H.P. per inhabitant did not sound very much, but it worked out to something like 700 units per head per annum. There were very few districts in this country which had got to the 300 mark, so they had still a good long way to go. In the mining industry the use of power was something like 2 H.P. per man employed, and per inhabitant apparently it worked out to something like ½ H.P. They could not frame a general expression for cost of supply to all users; these must be divided into classes. There was the detail distribution class in which the capital charges were possibly twice or three times the working costs; then the average power user for whom the capital charges and the working

costs were about equal, and there was the larger user for whom the capital cost possibly dropped to half the working costs. As to not tapping transmission lines between stations, Mr. Watson's view was to connect the stations by a ring main, which had many advantages but great disadvantages. Often instead of putting a ring round an area it was more economical to put, so to speak, a spinal main or a backbone through it, and to do all the control and all regulation at the central point. He did not want to minimise the value of overhead lines, but if possible to have some discussion on the possibilities of underground cables.

LEGAL.

Carriers and Delivery to Buyers.

Judge Graham, K.C., gave a considered judgment of considerable importance to traders who dispatch goods by carriage or through the post, in the Bow County Court, on December 1st. The plaintiffs in the action were Messrs. J. Evershed and Co., of Fairfield Road, Bow, printers and stationers, and they sued a number of firms all over the country for outstanding accounts. The Registrar of the Court refused to accept as proof of delivery, physically, to the buyers, the carriers' receipts produced by the plaintiffs. Judge Graham delivered the following judgment:—

"Section 32 of the Sale of Goods Act says that where in pursuance of a contract of sale the seller is authorised or required to send the goods to the buyer, delivery of the goods to the carrier for the purpose of transmission to the buyer is *primâ facie* deemed to be a delivery of the goods to the buyer. This section does not say that the authority must be in writing, or must have been given in any particular way, and in my view it may be presumed to have been given if the facts justify such an assumption. In these cases before me, the buyers carried on business at considerable distances from the sellers, and in such cases it is the practice to deliver the goods to the carrier, and I think the buyer, in the absence of any instruction to the contrary, must be presumed to have intended the goods to be sent to him in the usual manner, and have given his authority. The goods were in fact delivered to carriers, and as delivery to the carrier is delivery to the buyer, both by reason of the above section, and according to well-settled law, there must be judgment for the plaintiffs, with costs."

Telephone Contract Dispute.

In the City of London Court, on November 30th, before Deputy Judge Sir John Paget, K.C., the Intercommunicating Telephone Co. sued Robert Hitchin & Co., cloth manufacturers, for £21, balance due for rent and installation charges in respect of a number of intercommunication telephones.

Lord Tiverton, for the plaintiffs, said that in addition to rent, the defendants contracted to pay 3d. per ft. for all additional wire above 100 ft., the latter to be based on *single* wire, not on cable. This eventually led to a charge of 3d. per foot on an excess of 2,940 ft., which the defendants thought was too much. Defendants had asserted that the contract was not explained to them, and also that they had been induced to enter the contract by misrepresentation. They stated that 700 ft. of wire was all that was necessary for the work, and had raised a counter-claim.

Mr. Poyser, for the defendants, said that he had seen the contract, and would, therefore, withdraw the counter-claim, and submit to judgment for the plaintiffs.

A Fatal Practical Joke.

The sequel to a fatal practical joke was heard in Linlithgow Sheriff Court on November 25th, when a young miner, James Docherty, pleaded guilty to having in the bothy of a shale mine at Bathgate, held a piece of electric cable in such a way as to make a connection between a fuse controlling the electric lights in the bothy and an iron handle on the door of the bothy, whereby another miner received an electric shock while in the act of opening the door, from which he died immediately.

An agent, on behalf of accused, said on the Sunday previous to the occurrence the accused himself had got an electric shock, and that had suggested to the lad that he might also give some of his comrades a shock. In doing so there was no malicious intent.

Sheriff Moffatt, in passing sentence, said he acquitted the accused entirely of wilful intent to do serious harm to anyone, but he could not acquit him of malicious intention in playing a practical joke. He fined the accused £20.

An Electricity Supply Contract. Application to Annul.

The hearing of the summons taken out by the North Metropolitan Electric Power Supply Co., asking for an order that four agreements made for the supply of electrical energy to the Corporation of Stoke Newington at certain prices and on specified terms be suspended or annulled on the ground that, owing to the alteration of trading conditions due to the war, they could not be enforced without serious hardship on the plaintiffs, was resumed by Mr. Justice P. O. Lawrence in the Chancery Division on Wednesday, December 1st.

Mr. Tyldesley Jones, K.C., continued for the plaintiffs the address which he had not concluded at the previous hearing. After dealing with the evidence on affidavit which had been filed on behalf of the defendants, he said that if his clients had got to keep on supplying the defendants at a price which was below cost, it meant that other customers would have to bear their proportion of the cost. If his Lordship annulled the agreement, the position would then be that the plaintiffs would lose the defendants as consumers, and that would mean that they would be saved the extra cost of generating that energy, and that they would be able to sell 838,000 units to other people at a proper commercial price. On the figures submitted, whether on behalf of the plaintiffs or the defendants, he said that the prospect for the former was one of serious loss if the agreement was continued. In 1916, he proceeded, the plaintiffs' paid-up capital was £840,000, and by 1919 that had been increased by £300,000. The net revenue for 1916 was £71,000. In 1918 it dropped to £53,000, and in 1919 it went up to £62,000. Sums were put to reserve in 1916-17-18, but nothing for 1919. The preference dividend was paid in full each year. The ordinary dividend was 10 per cent. in 1916 and 1917; in 1918 nothing was paid, and for 1919 4½ per cent. was paid, but at the expense of the reserve fund. The point made by the defendants that the undertaking was making a profit and that that was a material matter to consider was really an attempt to appropriate for their benefit the profit the plaintiffs were making on other people's contracts. The effect of the defendants' contract was cumulative.

Mr. Jenkins, K.C., on behalf of the defendants, said his first contention was that upon the true construction of the Act the soaring prices of coal and labour were not an alteration of trading conditions within its meaning. His second was that the alteration was not one that was caused by the war. The third point was whether in the circumstances of the case there was serious hardship. Upon that there were subsidiary questions as to what his Lordship was entitled to consider in dealing with the question of hardship. The fourth point arose only if his Lordship was against him on the other three, and that was that no reasonable offer had ever been made to the defendants. He submitted that the Court would only annul the contract if it thought that the insisting party was demanding his pound of flesh and would not be reasonable. In the last resort he would ask the Court to say to the plaintiffs: "You can't treat these people as if they had got no contract at all. You must make them an offer of something which, having regard to their strong position, it is reasonable should be made." The rise in the cost of labour and material could no longer be said to be occasioned by the "present war" within the meaning of the statute, but was due to the working of economic forces in times of what was really peace, although technically the war had not yet been entirely concluded. It was not serious hardship that the plaintiffs should go on supplying the defendants at a loss because they had other business which brought them in a profit.

At this point the hearing was adjourned.

On Thursday, Mr. Jenkins said the object of Mr. Hann's figures was to show by results that this was an improvident bargain on the part of the plaintiffs from the first, and that on their own showing there was a loss on it from the first, and the defendants suggested that the plaintiffs were now, at the defendants' expense, seeking to make that certain which was before probable, namely, to get rid of the contract and if necessary to make a new bargain on their own terms based on what they considered was the trading profit to be aimed at.

Mr. Tyldesley Jones, in his reply, referring to the offer to supply on revised terms, said the defendants had full power to increase their charges to consumers. It was the ultimate basis of political economy that the consumer must bear the extra cost.

His Lordship said he would consider his judgment.

Theft.

At Hampstead Police Court, on December 4th, Leonard Marriott, 41, an electrician, of Lyme Terrace, Camden Town, pleaded "Guilty" to breaking into 8, Rosslyn Hill, Hampstead, and stealing a navy blue coat, gloves, silk, and brooches, and 15 £1 Treasury notes, the property of Mrs. Esmond Addington. A remand was ordered.—*The Times.*

East Anglian Electricity, Ltd.

A petition to confirm a reorganisation of the capital of this company was before Mr. Justice P. O. Lawrence in the Chancery Division on Tuesday, November 30th.

Mr. A. C. Clanson, K.C., for the company, said there were 99,300 ordinary shares and 200 founders' shares, and the only thing that it was required to do was to turn the founders' shares into 200 ordinary shares and consolidate them with the 99,300 ordinary shares, so as to make them all one class. The point was that the company had attempted to do this by issuing 3,000 ordinary shares to the 200 founders on the footing of 15 ordinary shares to one founder's share. That had caused

some difficulty, and the result was that a rather complicated agreement had to be made to put the matter right. Meetings of shareholders had been held which had sanctioned the alteration. The same meetings also dealt with the workmen's shares, the rights of which had had to be altered because they were issued in a somewhat informal way.

His Lordship gave his approval to the scheme of reorganisation as asked.

Antiseptic Telephones.

In the City of London Court, on November 30th, a claim was made by Livermore & Knight, Ltd., 180, Fleet Street, against Mr. R. J. Kirby, North Finchley, for £6 17s. 6d. balance of account for antiseptic telephone mouthpieces supplied for the front of telephone instruments.

Sir John Paget, K.C., Deputy Judge, found for the plaintiffs for the amount claimed with costs.

Interference with a Meter.

At Birmingham Police Court, on December 3rd, Alfred Downes, trading as the Aston Electrical Company, of 124, New Avenue, Acocks Green, was fined 40s. for unlawfully connecting a meter with an electric line without having given 48 hours' notice of his intention to the Birmingham Electric Supply Department. Mr. Minshall, of the Town Clerk's Department, who prosecuted, stated that defendant's supply of electric current was cut off because he had not paid his account. It was found when a representative of the department went to remove the meter that the supply had been reconnected.

NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

32,834. "Sparking plugs." H. E. Ashdown. November 22nd.

32,836. "Wind-power electric lighting plant." H. Valentine. November 22nd.

32,838. "Selector switches." I. H. Parsons. November 22nd.

32,865. "Mechanisms for step-by-step devices, &c." Automatic Telephone Manufacturing Co. November 22nd.

32,869. "Electric switches, fuses, controllers, &c." W. L. Barber. November 22nd.

32,890. "Electric luminous discharge lamps." J. Pintsch Akt.-Ges. November 22nd. (Germany, November 21st, 1919.)

32,898. "Spark plugs." Champion Ignition Co. November 22nd. (U.S., November 22nd, 1919.)

32,909. "Tramway rails and tracks." R. Haddan (Atlantis Akt.-Ges.). November 22nd.

32,934. "Means for bonding and fixing metal-covered electric cables and wires." Edison Swan Electric Co. and F. C. Raphael. November 22nd.

32,936. "Electric switches." H. Garde. November 22nd.

32,937. "Spark plug." Ignition Co. and A. A. Thornton (Ignition Co.). November 22nd.

32,940. "Electric power transmission from fluid pressure engine to driving shaft or axle." J. D. Roots. November 22nd.

32,962. "Domestic electrical apparatus." J. E. Blurton. November 23rd.

32,976. "Renewal of filaments of valves for wireless telegraphy, &c." S. Coxon and W. A. Williams. November 23rd.

32,981. "Focusing vehicle electric lamps." P. L. A. Letondu. November 23rd.

32,992. "Electric overhead lines. R. C. Horn and H. F. Tessmann. November 23rd.

32,995. "Insulated tubes." Western Electric Co. (Western Electric Co.). November 23rd.

33,002. "Device for use with gear cases of electric tramcars, &c." J. Wilson. November 23rd.

33,004. "Electromagnet arrangements." R. Fiedler and K. Höpfner. November 23rd. (Germany, February 5th.)

33,015. "Control of electric generating plant, and switches therefor." W. J. Bransom and H. J. Read. November 23rd.

33,017. "Controlling circuits of electromagnets." A. West & Co. and W. L. Wise. November 23rd.

33,028. "Push-button control electric lifts, &c." Otis Elevator Co. and Waygood-Otis, Ltd. (Otis Elevator Co.). November 23rd.

33,048. "Electric speed regulator systems." Metropolitan-Vickers Electrical Co. November 23rd. (U.S., January 12th.)

33,056. "Wireless transmission of signals." E. C. Hanson. November 23rd. (U.S., August 27th, 1917.)

33,057. "Wireless phonographs, &c." E. C. Hanson. November 23rd. (U.S., June 4th, 1918.)

33,058. "Directing and controlling self-propelled torpedoes, &c." E. C. Hanson. November 23rd. (U.S., June 4th, 1918.)

33,059. "Radio-signalling systems for life boats." E. C. Hanson. November 23rd. (U.S., February 20th, 1919.)

33,060. "Locating ore bodies by electrical means." E. C. Hanson. November 23rd. (U.S., May 7th, 1919.)

33,061. "Electro-therapeutic apparatus." E. C. Hanson. November 23rd. (U.S., July 12th, 1919.)

33,062. "Telephone apparatus for the deaf." E. C. Hanson. November 23rd. (U.S., June 11th, 1919.)

33,063. "Wireless transmission of speech." E. C. Hanson. November 23rd. (U.S., June 18th, 1917.)

33,068. "Electric lighting, heating, and power installations." W. J. Branson and H. J. Read. November 23rd.

33,093. "Electric switches for ships' use." G. P. Dennis. November 24th.

33,099. "Connecting fittings for electric lights, &c." F. J. Tregoning. November 24th.

33,107. "Electric tail lamp for motor cycles, cars, &c." F. Hammer. November 24th.

33,116. "Electric arc lamps." F. Raven. November 24th. (Germany, July 12th.)

33,117. "Sparking plug." R. B. Elliott. November 24th.

33,122. "Electric fuse contact." R. Timmins. November 24th.

33,133. "Automatic electric switch." C. Donovan. November 24th.

33,158. "Electrical starting mechanism for internal-combustion engines." H. Lucas and W. C. Turner. November 24th.

33,160. "Accumulators for starting and operating internal-combustion engines, &c." S. Z. de Ferranti. November 24th.

33,169. "Mounting brush-holders upon electric motors." B. Platschick. November 24th. (France, December 24th, 1919.)

33,188. "Means for recording telephone calls." A. W. Wood. November 24th.

33,192. "Portable electric light and power plant." C. H. Ferguson. November 24th.

33,267. "Typing by wireless." C. H. Keeling. November 25th.

33,289. "Aerials for wireless signalling." H. T. Ellis. November 25th.

33,292. "Electric junction boxes, &c." W. H. Ainsworth, H. Bailey, and H. Hopkinson. November 25th.

33,303. "Recording and reproducing sound waves." C. H. A. Bennett and L. T. M. Gray. November 25th.

33,319. "Train lighting, &c., dynamos." W. Heaton and J. Stone & Co. (Heaton). November 25th.

33,342. "Sound recording and reproducing machines." F. Adams. November 25th. (U.S., January 31st.)

33,364. "Devices for testing sparking plugs and magnetos." E. Hammond. November 26th.

33,369. "Electric iron." E. Bassett. November 26th.

33,393. "Alternating current generators." H. Church, Crompton & Co., and W. G. Smith. November 26th.

33,397. "Electric window cleaner." W. C. Comber. November 26th.

33,441. "Spark plugs." Champion Ignition Co. November 26th. (U.S., November 26th, 1919.)

33,471. "Giving liquids an electrical discharge." E. E. Littlefield. November 26th.

33,478. "Contrivance to ensure secrecy of conversations by telephone." A. C. Ingle (Speight) and R. Speight. November 26th.

33,480. "Direction-finding for sound waves, &c." T. G. Hodgkinson. November 26th.

33,500. "Fitting for mechanical or electric horns." W. S. Adams. November 27th.

33,509. "High-tension electric ignition devices for internal-combustion engines." R. Bosch Akt.-Ges. November 27th. (Germany, February 19th.)

33,515. "Electric lamp and switch holder." A. N. Haddow and A. P. Rutherford. November 27th.

33,523. "Control of electrical heating apparatus." R. J. Barker, E. G. Moore, and F. Wilde. November 27th.

33,533. "Chain for driving dynamos, &c." E. Lycett. November 27th.

33,546. "Electric accumulators, &c." H. Leitner. November 27th.

33,556. "Sparking plugs, &c." G. Bradshaw, D. D. Esson, and G. A. Henshaw. November 27th.

33,562. "Electric batteries." D. Pepper. November 27th. (U.S., November 29th, 1919.)

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

16,427. "Enclosed electric arc devices." British Thomson-Houston Co. (General Electric Co.). November 16th, 1916. (153,331.)

1918.

5,881. "Electric radiators." C. O. Poole, R. G. Manifold, and A. R. Huntington. September 20th, 1918. (153,334.)

1919.

11,554. "Automatic telephone line-finder systems." W. Cross (D. S. Hulfish). May 8th, 1919. (153,340.)

16,705. "Coil winding machines." Igranic Electric Co. and S. R. Wright. July 3rd, 1919. (153,350.)

18,458. "Electric signalling systems." Western Electric Co. (Western Electric Co.). July 24th, 1919. (153,357.)

18,918. "Electrical heating elements." E. J. Hazelton. July 30th, 1919. (153,368.)

18,975. "Electric motors." A. Heurtebise. July 31st, 1919. (153,370.)

19,014. "Electric lamp holders for the lamps of motor and other vehicles." R. F. Rowe. July 13th, 1919. (153,376.)

19,056. "Electric heaters." British Thomson-Houston Co. (General Electric Co.). August 1st, 1919. (153,378.)

19,102. "Electric switches." A. Pouchain. August 14th, 1918. (131,285.)

19,284. "Magneto-electric machines." American Bosch Magneto Corporation. September 27th, 1918. (133,025.)

20,343. "Sparking plugs." W. Miller. August 19th, 1919. (153,401.)

20,531. "Alternating current relay." Automatic Telephone Manufacturing Co. and G. W. Flynn. August 21st, 1919. (Addition to 121,385.) (153,405.)

20,760. "Senderless automatic telephone satellite systems." Western Electric Co. and G. Deakin. August 23rd, 1919. (153,407.)

21,120. "Flywheel magneto devices for internal-combustion engines." Villiers Engineering Co. and F. Pountney. August 28th, 1919. (153,411.)

21,293. "Regulating systems for electric circuits." British Thomson-Houston Co. (General Electric Co.). August 29th, 1919. (153,412.)

21,548. "Automatic time switches or interrupters for use in electrical circuits." J. J. Bjerregaard. July 13th, 1917. (132,255.)

22,589. "Electric incandescent lamps." G. Calvert. September 13th, 1919. (153,421.)

23,096. "Device for securing electric cables." Crompton & Co. and W. F. Jones. September 19th, 1919. (153,431.)

28,628. "Safety controlling gear for electrically-propelled vehicles." R. Garrett & Sons and F. Garrett. November 19th, 1919. (Addition to 103,617.) (153,467.)

30,113. "Adjustable connection for electric light fittings." H. Hubener. December 2nd, 1919. (153,471.)

1920.

5,737. "Electrically-operated sound generators." M. I. Pupin. February 4th, 1918. (139,497.)

5,925. "Telephone systems." Automatic Telephone Manufacturing Co. May 2nd, 1919. (142,793.)

7,831. "Electric switches." Igranic Electric Co. (Cutler Hammer Manufacturing Co.). March 10th, 1920. (153,524.)

8,801. "Searchlights." Siemens & Co., Geb. August 1st, 1917. (140,799.)

12,225. "Devices for controlling electric discharges through vapours, and methods of operating said devices." British Thomson-Houston Co. (General Electric Co.). April 15th, 1915. (Divided application on 5,684/15.) (153,532.)

17,048. "Type printing telegraphs." Siemens & Halske Akt.-Ges. December 16th, 1918. (146,123.)